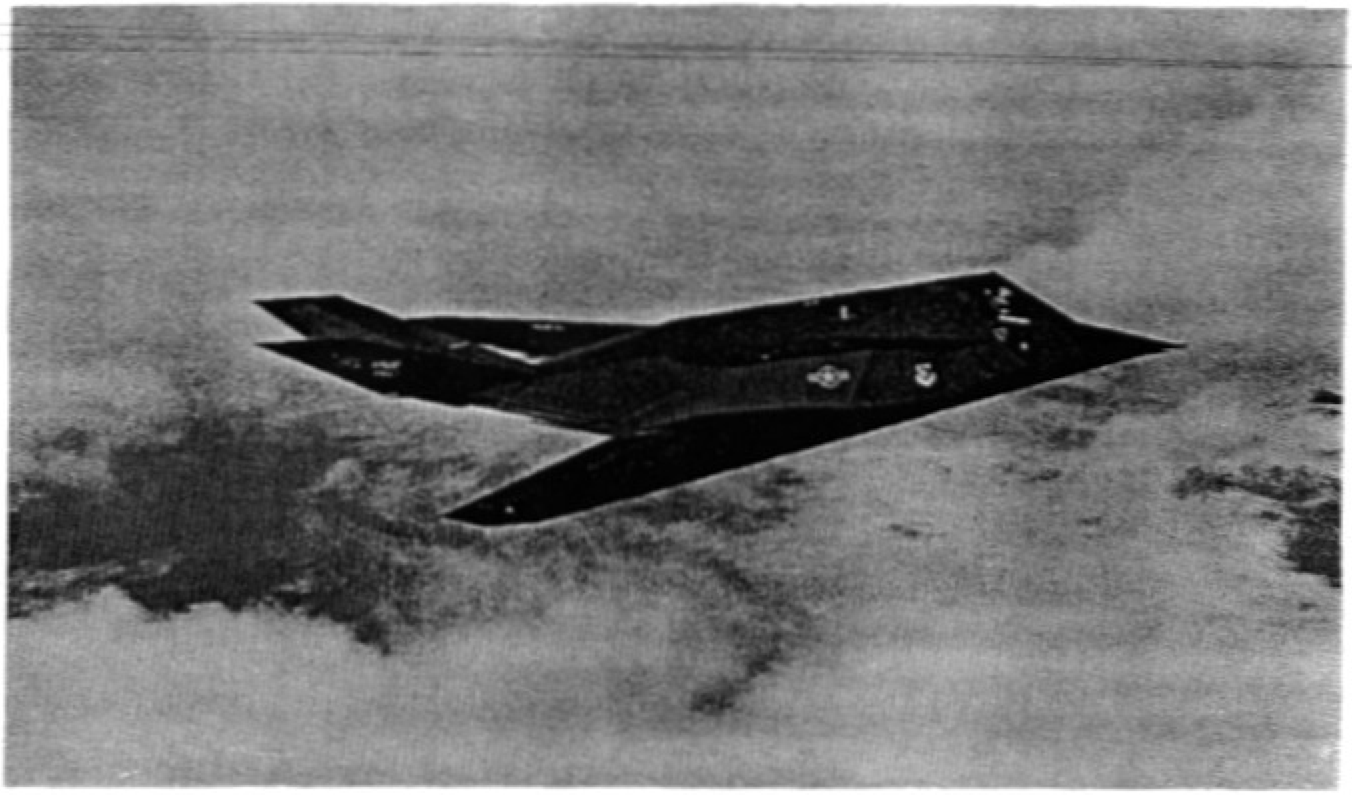
OCIP SUPPLEMENT TO THE UTILITY FLIGHT MANUAL

USAF SERIES

F-117A AIRCRAFT

LOCKHEED ADVANCED DEVELOPMENT CO.



DISTRIBUTION STATEMENT

This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. Government Agencies. Other requests for this document must be referred to SM-ALC/QL.

See reverse side (Page T-2) for disclosure notice, handling and destruction notice, supplemental notice, and supersedure notice.

Commanders are responsible for bringing this publication to the attention of all affected personnel.

PUBLISHED UNDER THE AUTHORITY OF THE SECRETARY OF THE AIR FORCE.

ISSUE B: 6 FEBRUARY 1992

DISCLOSURE NOTICE

If this document is approved for release to a foreign government, it is furnished upon the condition that it will not be released to another nation without specific authority of the Department of the Air Force of the United States, that it will be used for military purposes only, that individual or corporate right originating in the information, whether patented or not, will be respected, that the recipient will report promptly to the U.S., any known or suspected compromise, and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States.

HANDLING AND DESTRUCTION NOTICE

Handle in compliance with distribution statement and destroy by any method that will prevent disclosure of the contents or reconstruction of the document.

SUPPLEMENTAL NOTICE

This manual is incomplete without the F–117A Utility Flight Manual (TO 1F–117A–1).

SUPERSEDURE NOTICE

See SP 5723, Numerical Index, for current status of Flight Manuals, Safety Supplements, Operational Supplements, and Flight Crew Checklists.

Reproduction for non-military use of the information or illustrations contained in this publication is not permitted. The policy for military use reproduction is established for the Army in AR 380-5, for the Navy and Marine Corps in OPNAVINST 5510.1B and for the Air Force in Air Force Regulation 205.1.

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

NOTE: The asterisk indicates pages changed, added, or deleted by the current change. The portion of text or illustration affected by the change is indicated by a vertical line in the outer margins of the page, + indicates deletion of text.

Dates of issue for original and changed pages are:

Issue .... B .... 3 Feb 92

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 84 CONSISTING OF THE FOLLOWING:

Page No.	* Change No.
Title	0
T-2	0
A	0
B Blank	0
a, b	0
i	0
ii Blank	0
iii	0
iv Blank	0
1-1	0
1-2 Blank	0
2-1, 2-2	0
3-1 thru 3-3	0
3-4 Blank	0
4-1 thru 4-45	0
4-46 Blank	0
Glossary-1 thru Glossary-4	0
Index-1 thru Index-5	0
Index-6 Blank	0
FO-1	0
FO-2 Blank	0
FO-3	0
FO-4 Blank	0
FO-5	0
FO-6 Blank	0
FO-7	0
FO-8 Blank	0
FO-9	0
FO-10 Blank	0

CURRENT FLIGHT CREW CHECKLIST
T.O. 1F-117A-1CL-1

ISSUE E 3 FEBRUARY 1992

*Zero in this column indicates an original page.

SAFETY/OPERATIONAL SUPPLEMENT SUMMARY

CURRENT UTILITY FLIGHT MANUAL	DATE	CHANGE NO/DATE
T.O. 1F–117A–1A	3 February 1992	

CURRENT APPLICABLE SUPPLEMENTS

NUMBER	DATE	SHORT TITLE

SUPERSEDED SUPPLEMENTS

NUMBER	DATE	SHORT TITLE

CHANGE DATA SUMMARY

The following information is added, revised or deleted per OFP–45

- Affect of Calibrated Airspeed Rate of Change on Display
- TTG/ETA Readout
- Out–of–Corridor Warning Symbol
- Raw ILS Data on HUD Display
- SMS Fault Isolation Format
- Additional INS Mode Advisories
- Pitch Ladder on VSD Display
- MARK Points Remaining; X Until Proper Conditions are Satisfied
- TACAN Data on HSD in MAN HDG Mode
- Default to Current Destination on EDIT Display
- EDIT DEST Buttons Moved to Right Side of Display
- Add LCMDI, RCMDI to Maintenance Display
- STBY Added to RCRD TM/SRCH Legend on DEP

Other changes

- D/TTG/RNG/DME/ID Corrected on HUD Display
- CRS Readout Box on Basic HSD Display
- Sensor Update Procedures Added

SAFETY/OPERATIONAL SUPPLEMENT SUMMARY

CURRENT UTILITY FLIGHT MANUAL	DATE	CHANGE NO/DATE
T.O. 1F–117A–1A	3 February 1992	

CURRENT APPLICABLE SUPPLEMENTS

NUMBER	DATE	SHORT TITLE

SUPERSEDED SUPPLEMENTS

NUMBER	DATE	SHORT TITLE

SCOPE

This supplement to the F-117A Utility Flight Manual (TO 1F-117A-1) contains information on aircraft that have been modified under the Offensive Combat Improvement Program (OCIP). This modification, Service Bulletin N-2618, incorporates a new Auxiliary Power Unit (APU), Color Multipurpose Display Indicators (CMDI), Flight Management System (FMS), Autothrottles (A/T), Data Entry Panel (DEP), Pilot Activated Automatic Recovery System (PAARS), and Flight Attitude Awareness Display (FAAD).

Except for the information contained herein, refer to the F-117A Utility Flight Manual (TO 1F-117A-1) for information common to WSC/WBI equipped F-117A aircraft.

TABLE OF CONTENTS

SECTION	TITLE	PAGE
SECTION I	DESCRIPTION	1–1
SECTION II	NORMAL PROCEDURES	2–1
SECTION III	EMERGENCY PROCEDURES AND ABNORMAL OPERATIONS	3–1
SECTION IV	AUXILIARY EQUIPMENT	4–1
SECTION V	OPERATING LIMITATIONS	REFER TO TO 1F–117A–1
SECTION VI	FLIGHT CHARACTERISTICS	REFER TO TO 1F–117A–1
SECTION VII	ADVERSE WEATHER OPERATION	REFER TO TO 1F–117A–1
APPENDIX A	PERFORMANCE DATA	REFER TO TO 1F–117A–1
APPENDIX B	PERFORMANCE DATA (RCS ENHANCERS INSTALLED)	REFER TO TO 1F–117A–1
FOLDOUT	FOLDOUT ILLUSTRATIONS	FO–1

SECTION I

DESCRIPTION

(AIRCRAFT MODIFIED UNDER THE OFFENSIVE COMBAT IMPROVEMENT PROGRAM)

TABLE OF CONTENTS

Introduction 1-1
Offensive Combat Improvement Program ... 1-1
Engine Fire Warning System 1-1
Environmental Control System 1-1

INTRODUCTION

This section describes systems which modify the F-117A aircraft under the Offensive Combat Improvement Program (OCIP). Information not presented is common to WSC/WBI aircraft and is found in F-117A Utility Flight Manual (F-117A-1).

OFFENSIVE COMBAT IMPROVEMENT PROGRAM

Aircraft modified under the Offensive Combat Improvement Program (OCIP), Service Bulletin N-2618 installed, have additional navigation and display capabilities.

ENGINE FIRE WARNING SYSTEM

ENGINE FIRE WARNING LIGHTS

The red FIRE warning light on the left side of the main instrument panel has been removed. The light on the right side of the main instrument panel is blank (see Figure FO-1). The light is non-functional but will illuminate when the fire detector system is tested.

ENVIRONMENTAL CONTROL SYSTEM

The environmental control system provides all the functions as described in F-117A, Utility Flight Manual (TO 1F-117A-1); however, due to increased avionics cooling requirements, a 60°F system is provided (see Figure FO-2). This air is used to cool the INS Interface Electronics Unit (IEU), the weapon system computers (WSC-1 and WSC-2), and the stores management processor (SMP) located in the right check bay. In the right forward equipment bay, this air cools the RLS computer and the map display processor. In the left forward equipment bay, it is used to cool the CMDI color display processor. In the center E bay, it is used to cool the RLS local oscillator unit, interface unit and power supply unit.

SECTION II

NORMAL PROCEDURES

TABLE OF CONTENTS

Introduction 2-1
Cockpit Interior Check 2-1
FCS Prestart BIT Procedure 2-1
APU Start 2-2

INTRODUCTION

Only the additional procedural steps required on aircraft with Service Bulletin N-2618, Offensive Combat Improvement Program, incorporated are listed in Section II. These steps will be included in subsequent changes to the Pilot's Abbreviated Checklist, TO 1F-117A-1CL-1. All other normal procedures are performed as shown in F-117A Utility Flight Manual (TO 1F-117A-1), for WSC/WBI aircraft.

COCKPIT INTERIOR CHECK

RIGHT CONSOLE CHECK

9. ECS control panel - Checked and set
   a. CKPT TEMP selector - AUTO COLD or MAN COLD

CAUTION

Starting the APU with the CKPT TEMP selector switch in MAN HOT or AUTO HOT position may result in APU compressor stall (surge).

10. L and R ENG BLEED AIR switches - NORM

CAUTION

- Initiating main engine start and/or selecting EPU ON switch with both engine bleed air switches in the OFF position will result in APU compressor stall (surge).

FCS PRESTART BIT PROCEDURE

NOTE

This test cannot be performed with hydraulic pressure on aircraft.

The FCS Prestart BIT Procedure is performed in accordance with normal procedures in F-117A Utility Flight Manual (TO 1F-117A-1).

NIAC SRT

1. FCS panel TEST-OFF switch - TEST
   Message No. 13 will appear in alpha-numeric readout.
2. A/P DISC, A/T DISC switchlights - Verify off
3. Throttles - Idle (position out of cutoff)

CAUTION

Throttles will move during this test.

4. MASTER TEST switch - ADC/NIAC
5. Master Test panel PUSH TO TEST switch - Press
6. ADC PASS light - Verify on, then off
7. FCS RESET - Press
8. CMDI TEST switch - Press to box TEST
9. CMDI NIAC switch - Press to box NIAC
10. A/T ENG - OFF switch - ENG
    Verify throttle movement.

NOTE

Autothrottle (A/T) ENG - OFF switch will disengage when SRT is complete. Verify NIAC COMP on CMDI and no failures are set.

11. CMDI NIAC switch – Press to unbox NIAC
12. MASTER TEST switch – OFF
13. Throttles – Off

APU START

If external power is available and on:

1. BATTERY switch – ON
2. FCS Prestart BIT – Perform

   Refer to FCS Prestart BIT Procedure, this section.

3. APU switch – ON

   Wait a minimum of three seconds after the APU OFF annunciator light has extinguished before continuing.

CAUTION

Attempting to run the EPU or start a main engine before the APU is operating at its normal output pressure can result in APU surge. The APU reaches its normal operating pressure approximately three seconds after the APU OFF annunciator light has extinguished and is accompanied by an audible rush of ECS airflow.

NOTE

The APU is normally started and the EMER HYD switch is positioned to ON during test number 58 of the FCS Prestart BIT procedure. Prior to positioning the EMER HYD switch ON, verify that the APU OFF light on the annunciator panel has been extinguished for a minimum of three seconds.

SECTION III

EMERGENCY PROCEDURES

TABLE OF CONTENTS

Introduction 3–1
Inflight Emergencies 3–1
Engine Emergencies 3–1
Environmental Control System Emergencies .. 3–1
Fuel System Emergencies 3–2
INS Failure 3–2
Equipment Failure Alerts 3–2

INTRODUCTION

Only the additional procedural steps required on aircraft with Service Bulletin N–2618, Offensive Combat Improvement Program, incorporated are listed in Section III. These steps will be included in subsequent changes to the Pilot's Abbreviated Checklist, F–117A–1CL–1. All other emergency procedures are performed as shown in F–117A–1, Utility Flight Manual, for WSC/WBI aircraft.

INFLIGHT EMERGENCIES

ENGINE EMERGENCIES

ENGINE FIRE

1. **AUTOTHROTTLE – DISENGAGE**

NOTE

> The autothrottle can be disengaged by positioning the AT ENG–OFF switch on the control panel to OFF, by pressing the autothrottle disconnect button on the right throttle, or by pressing the disengage paddle switch.

1a. THROTTLE – IDLE

ENGINE OVERTEMPERATURE

1. Autothrottle — Disengage

1a. Throttle – Retard

ENGINE OIL PRESSURE MALFUNCTION

1. Autothrottle – Disengage

1a. Throttle — Idle

STARTER ENGAGED LIGHT (IN FLIGHT)

1. Autothrottle – Off

1a. Throttle – Idle

AMAD OIL PRESSURE/TEMPERATURE MALFUNCTION

1. Autothrottle – Off

1a. Throttle – Idle

ENGINE STALL

1. Autothrottle – Off

1a. Throttle – Idle

ENVIRONMENTAL CONTROL SYSTEM EMERGENCIES

SINGLE BLEED AIR DUCT OVERHEAT (ECS ANNUNCIATOR LIGHT ON)

4. Autothrottle - Off
5. Avoid high power settings

DUAL BLEED AIR DUCT OVERHEAT (ECS ANNUNCIATOR LIGHT ON)

5. Autothrottle - Off
6. Avoid high power settings
7. Land as soon as possible

ECS OVERHEAT (ECS ANNUNCIATOR LIGHT ON)

5. Autothrottle - Off
6. Avoid high power settings
7. Land as soon as possible

FUEL SYSTEM EMERGENCIES

FUEL PRESS (L OR R) LOW INDICATION

4. Autothrottle - Off
5. Fuel flow on failed side - 2000 pph minimum and use differential throttle to correct fuel imbalance
6. Land as soon as practical

If FUEL LOW light comes on:

7. X FEED VLV - CLSD

INS FAILURE

With an INS failure, the system automatically fails to the DR mode, a boxed DR legend will appear on the VSD, and the autopilot and autothrottle will disengage (if previously engaged). The velocity vector will be replaced by the W symbol on the VSD and HUD. Other symbology is not affected. Navigation data is provided to the NIAC, HSI and ADI by the AHRS. If DR navigation information does not appear on the VSD, use the standby instruments.

If autopilot operation is desired:

1. A/P CH1-DUAL-CH2 switch — CH2
2. A/P ENG-OFF switch — ENG

If autothrottle operation is desired:

3. A/T CH1-DUAL-CH2 switch — Ch2
4. A/T ENG-OFF switch — ENG

NOTE

GS SELECT is inoperative with CH 2 selected.

EQUIPMENT FAILURE ALERTS

Equipment failure alerts are displayed in the lower right corner of the CMDIs. Each alert can contain up to six characters and is boxed in yellow. The alerts and a brief explanation of each are presented in Figure 3-1.

SECTION IV
AUXILIARY EQUIPMENT

TABLE OF CONTENTS

Introduction 4-2
Autopilot and Autothrottle 4-2
  Controls and Indicators 4-2
Autopilot Limits 4-4
HUD DEP Control Panel 4-4
Pilot Activated Automatic Recovery System (PAARS) 4-6
OCIP HUD Displays 4-6
  OCIP Basic Head-Up Display 4-6
  OCIP HUD Display – ILS Steering 4-9
  OCIP HUD Display – TACAN Steering 4-10
  OCIP HUD Display – Navigation Steering 4-11
Color Multipurpose Display Indicators (CMDI) 4-11
  Map Display 4-12
  Edit Display (CMDI) 4-16
  Image Data Frame Display 4-18
  VSD Display 4-18
  HSD Display 4-21
  SMD Display 4-24
  Status Display 4-24
  Flight Attitude Awareness Display (FAAD) 4-26
Return-to-Base Mode 4-26
Safe Corridor 4-29
Data Entry Panel (DEP) 4-29
  General Rules 4-29
  Unplanned Autopilot/Autothrottle Modes 4-30
  Altitude Mode 4-30
  Steering Modes 4-30
  Speed Modes 4-39
  Time Over Point (TOP) 4-39
  Pre-Planned Modes 4-40
  HNAV 4-40
  VNAV 4-40
  SNAV 4-40
  Time Over Target (TOT) 4-40
  Edit Displays (DEP) 4-41
  Spreadsheeting 4-42
  Miscellaneous DEP Functions 4-42
  Keypad Entry Limits 4-43
  Auxiliary Navigation Panel 4-43
  Turn Short/Overfly Steering 4-43
Sensor Updates 4-43
  IRADS Sensor Update 4-43
  HUD Sensor Update 4-44
  Visual Update 4-44
  IRADS/MAP Update 4-44
  MARK (Reconnaissance Point Identification) 4-45
  Altitude Calibration 4-45

INTRODUCTION

Service Bulletin N-2618, Offensive Combat Improvement Program (OCIP), adds several improvements to the following weapon system capabilities.

- A full-authority autothrottle
- A Flight Management System (FMS), which allows four-dimensional (latitude, longitude, altitude, and time) pre-planned or pilot-selectable flight profiles. The pre-planned modes are HNAV (horizontal), VNAV (horizontal with altitude), and SNAV (speed).
- A Pilot Activated Automatic Recovery System (PAARS)
- Color Multifunction Display Indicators (CMDIs) and a Data Entry Panel (DEP) in place of the up-front control panel.

AUTOPILOT AND AUTO-THROTTLE (A/P AND A/T)

Refer to F-117A Utility Flight Manual (TO 1F-117A-1) for basic autopilot functions. The following coupled modes are available with OCIP (-12 NIAC).

- Mach, GS, and angle of attack select
- CAS hold and select
- Altitude hold and select
- Pre-planned climb/descent speeds and/or rates of climb/descent
- Destination, course line, course select, manual heading, TACAN, and localizer steering modes

WARNING

The autopilot and autothrottle may disconnect without the disconnect lights illuminating during some electrical power transients. If the autopilot and autothrottle disconnect with no lights coming on, other indications are available. On the VSD, the FMS status indications (SC, VC, HC) are green when coupled. When autopilot and autothrottle disconnect occurs, the C disappears and S, V, and H will change to white. On the sensor display, the NAV and ALT advisories will appear and the IRADS may re-initialize. The engage switches will drop out.

NOTE

The entire planned flight profile can be flown automatically. Data for selected modes may be monitored and flown manually or portions may be edited to change the planned flight profile.

AUTOPILOT/AUTOTHROTTLE CONTROLS AND INDICATORS

(Refer to Figure 4-1)

A/P ENGAGE SWITCH

Refer to F-117A Utility Flight Manual (TO 1F-117A-1)

A/T ENGAGE SWITCH

With weight off the gear, moving the A/T switch to the magnetically-held engage position turns on CAS hold at the current CAS. The switch springloads to the OFF position whenever the autothrottle is disengaged by any means.

A/P CHANNEL SELECTOR SWITCH

Refer to F-117A Utility Flight Manual (TO 1F-117A-1)

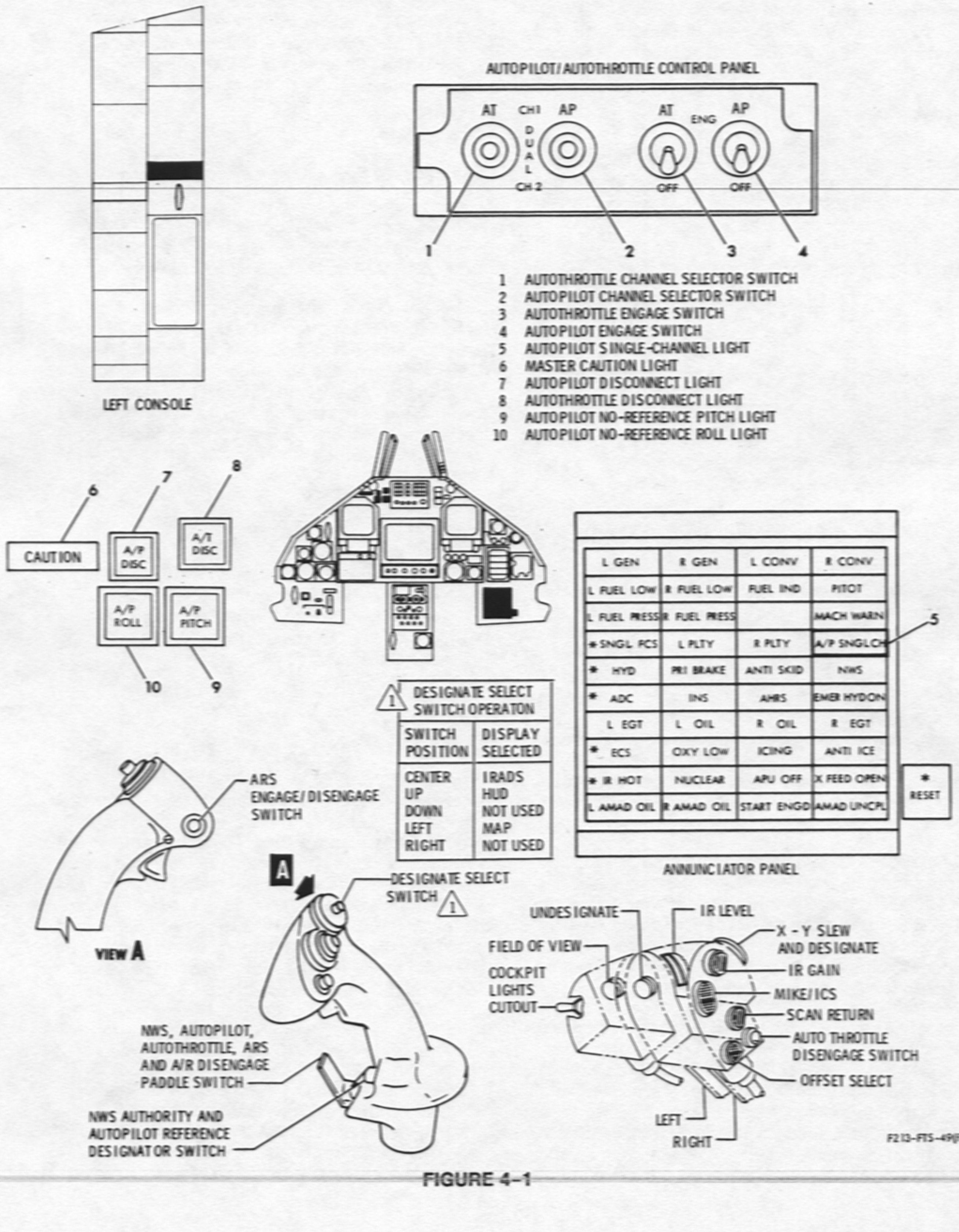
A/T CHANNEL SELECTOR SWITCH

The three position (CH-1 - DUAL - CH-2) autothrottle channel selector switch (refer to Figure 4-1) is used to select which autothrottle computer is used. Both CH-1 and CH-2 use the ADC and FLCC for input data. In the DUAL position, the CH-1 computer is used and cross-channel monitoring is performed. If the channels differ significantly the autothrottle disengages. When the switch is in CH-1 or CH-2, only that channel is used and no cross-channel monitoring is performed. When the autothrottle is disengaged, the switch spring-loads to the DUAL position. If the autothrottle is engaged with CH-1 or CH-2 selected, the A/P SNGL CH light on the annunciator panel is illuminated.

CAUTION

The single channel selected may engage even though reference data is faulty, the pilot must determine if the selected single channel is operating properly.

AUTOPILOT/AUTOTHROTTLE CONTROLS AND INDICATORS


AUTOPILOT/AUTOTHROTTLE CONTROL PANEL
AT
CH1
DUAL
CH 2
AP
AT
ENG
AP
OFF
OFF
1
2
3
4
LEFT CONSOLE
6
CAUTION
7
A/P DISC
8
A/T DISC
A/P ROLL
A/P PITCH
10
9
5
ARS ENGAGE/DISENGAGE SWITCH
VIEW A
A
DESIGNATE SELECT SWITCH 1
UNDESIGNATE
IR LEVEL
X - Y SLEW AND DESIGNATE
FIELD OF VIEW
IR GAIN
COCKPIT LIGHTS CUTOUT
MIKE/ICS
SCAN RETURN
AUTO THROTTLE DISENGAGE SWITCH
OFFSET SELECT
NWS, AUTOPILOT, AUTOTHROTTLE, ARS AND A/R DISENGAGE PADDLE SWITCH
NWS AUTHORITY AND AUTOPILOT REFERENCE DESIGNATOR SWITCH
LEFT
RIGHT
F213-FTS-49(F)

1 AUTOTHROTTLE CHANNEL SELECTOR SWITCH
2 AUTOPILOT CHANNEL SELECTOR SWITCH
3 AUTOTHROTTLE ENGAGE SWITCH
4 AUTOPILOT ENGAGE SWITCH
5 AUTOPILOT SINGLE-CHANNEL LIGHT
6 MASTER CAUTION LIGHT
7 AUTOPILOT DISCONNECT LIGHT
8 AUTOTHROTTLE DISCONNECT LIGHT
9 AUTOPILOT NO-REFERENCE PITCH LIGHT
10 AUTOPILOT NO-REFERENCE ROLL LIGHT

1 DESIGNATE SELECT SWITCH OPERATON

SWITCH POSITION	DISPLAY SELECTED
CENTER	IRADS
UP	HUD
DOWN	NOT USED
LEFT	MAP
RIGHT	NOT USED

L GEN	R GEN	L CONV	R CONV
L FUEL LOW	R FUEL LOW	FUEL IND	PITOT
L FUEL PRESS	R FUEL PRESS		MACH WARN
* SNGL FCS	L PLTY	R PLTY	A/P SNGL CH
* HYD	PRI BRAKE	ANTI SKID	NWS
* ADC	INS	AHRS	EMER HYD ON
L EGT	L OIL	R OIL	R EGT
* ECS	OXY LOW	ICING	ANTI ICE
* IR HOT	NUCLEAR	APU OFF	X FEED OPEN
L AMAD OIL	R AMAD OIL	START ENGD	AMAD UNCPL

* RESET

ANNUNCIATOR PANEL

FIGURE 4-1

THROTTLE

An autothrottle disengage button is located on the inboard side of the throttle (refer to Figure 4–1). Pressing this button once disengages the autothrottle and illuminates the A/T DISC indicator light. A second depression extinguishes the light.

CONTROL STICK

Depressing the paddle switch disengages both the autopilot and autothrottle (if engaged) and illuminates the A/P DISC and A/T DISC lights. A second depression extinguishes the lights.

AUTOPILOT DISCONNECT LIGHT

Refer to F–117A Utility Flight Manual (TO 1F–117A–1)

AUTOTHROTTLE DISCONNECT LIGHT (A/T DISC)

This yellow light (refer to Figure 4–1) illuminates whenever the autothrottle disengages, whether by pilot action or because of a malfunction.

AUTOPILOT DUAL NO REFERENCE LIGHTS

The A/P PITCH and A/P ROLL no reference lights are located on the upper left instrument panel (refer to Figure 4–1). When the autopilot is turned on and a steering mode, or VNAV or HNAV, is selected, the A/P ROLL light will illuminate. If altitude hold or select is activated, the A/P PITCH light will illuminate steady. If VNAV is selected, both lights come on steady. Either or both lights will extinguish when the autopilot reference designator switch is depressed, indicating autopilot engagement in that mode. Subsequent steering mode changes or changes to commanded values (altitude, course, etc.) will not illuminate the no–reference lights.

If the control stick is moved more than ±.04 inches from center in pitch or roll, the corresponding axis will de–reference, the autopilot will revert to control stick steering in that axis, and the no–reference light will come on steady. Depressing the reference designator switch will re–reference the autopilot and extinguish the light(s).

The A/P ROLL light will flash if navigation reference is lost for any reason (lost signal, mode deselected, etc.). The A/P PITCH light will flash if the altitude mode is deselected or altitude reference is lost with the autopilot engaged. In either case, re–selecting a steering/altitude mode will change the light(s) to steady (re–reference required); pressing the light(s) will turn off the light(s) if no mode is present.

NOTE

Some failures may cause a flashing A/P PITCH light to remain on steady after it is pushed. If this occurs, disengaging and re-engaging the autopilot will restore normal operations.

AUTOPILOT LIMITS

In addition to those described in F–117A Utility Flight Manual (TO 1F–117A–1), the following features limit AOA and speeds with autopilot engaged.

If, for any reason, the aircraft descends or climbs more than approximately 300 feet from a held or selected altitude, the autopilot will disengage. This can occur, for example, if the aircraft is allowed to slow to the angle of attack limit. If thrust is sufficient to exceed maximum airspeed or Mach number (whether level or not), gear up or down, the autopilot will command nose up sufficient to maintain speed below the limit.

NOTE

Changes in commanded speeds or altitudes while in a climb and near the level–off altitude can, in isolated instances, cause the 300 feet limit to be exceeded and cause the autopilot to disconnect.

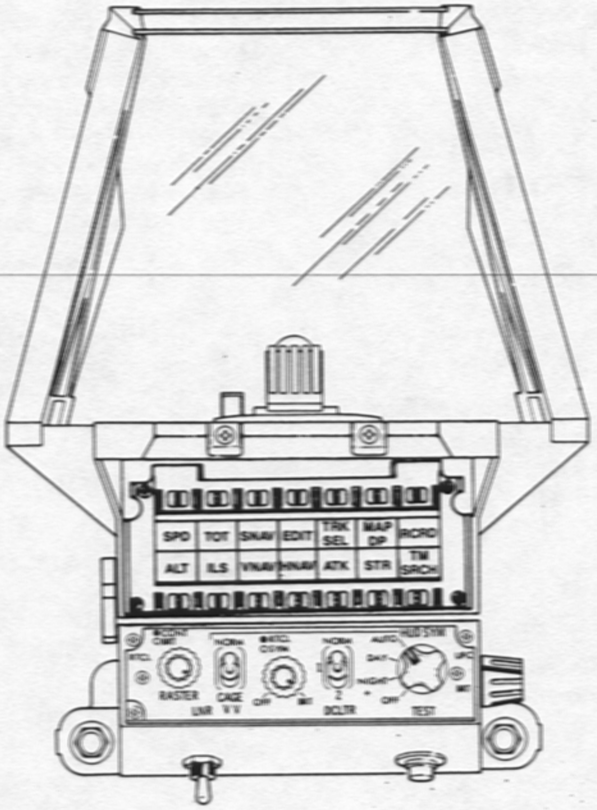
HUD DEP CONTROL PANEL

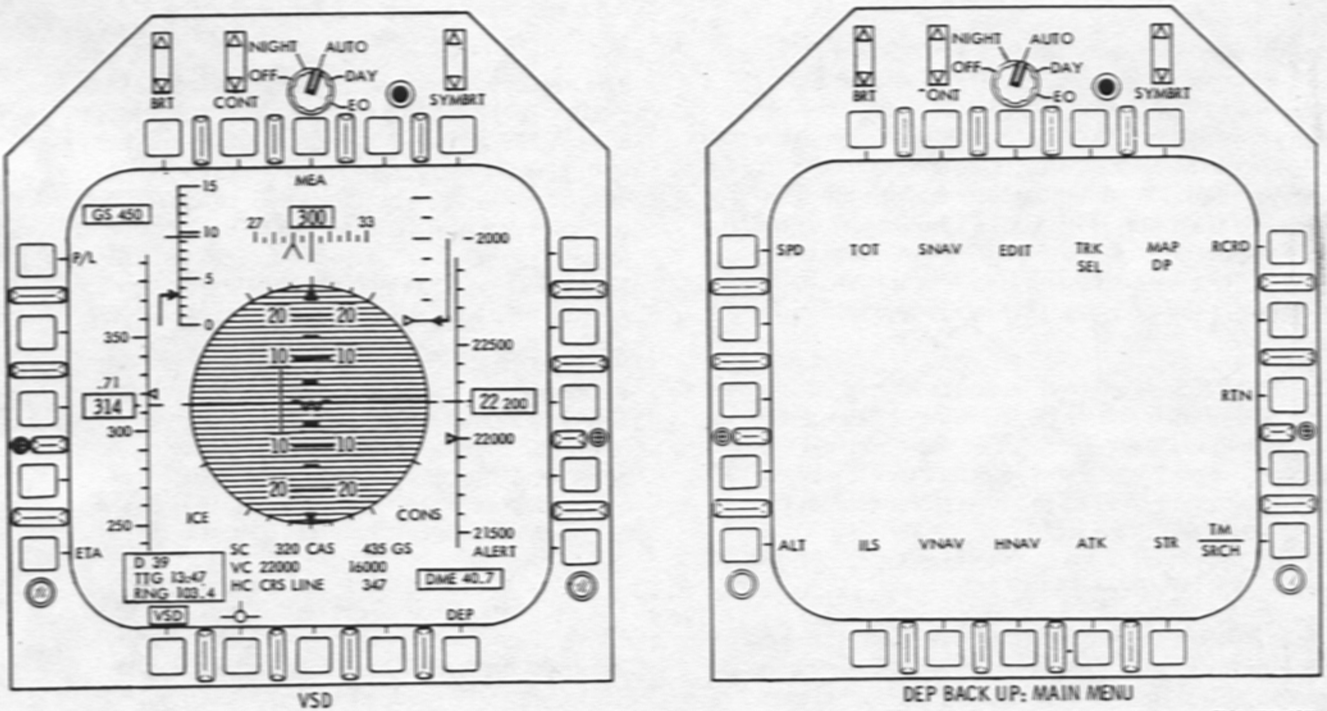
Refer to F–117A Utility Flight Manual Classified Supplement (TO 1F–117A–1–1) for basic HUD controls. In OCIP aircraft, the HUD power and symbol brightness controls also turn on the DEP (see Figure 4–2). DEP brightness is controlled by the brightness control (right side of HUD). The light test switch button (on the bottom of the panel) is now a DEP reload button. Pressing this button momentarily causes partial reload of the HUD display processor and usually clears up DEP display malfunctions.

NOTE

Cycling the HUD power control off and back on alternately switches the sensor display between the FAAD (Flight Attitude Awareness Display) and FAAD backup display (see Figure 4–16).

HUD, DATA ENTRY PANEL, AND CMDI





VSD

DEP BACK UP: MAIN MENU

F213-FTS-51(F)

COLOR MULTIPURPOSE DISPLAY INDICATORS (CMDI)

FIGURE 4-2

A reversionary (backup) mode (see Figure 4-2) is available that displays all DEP functions on either CMDI by pressing the DEP button when VSD is displayed. Pressing the RTN button restores the VSD display.

PILOT ACTIVATED AUTOMATIC RECOVERY SYSTEM (PAARS)

The PAARS provides a means of restoring normal aircraft attitude in case the pilot experiences spatial disorientation; however, the PAARS is not a departure or spin recovery system, or a ground collision avoidance system.

The PAARS is activated by pressing the automatic recovery system (ARS) switch located on the stick grip (refer to Figure 4-1). The aircraft will assume wings level with a small positive pitch attitude.

CAUTION

Activation of the PAARS with an engine power lever at idle due to a malfunction (FIRE, EGT OIL, or ECS light on) will cause power lever movement and may result in serious damage to engine or structure.

The automatic recovery system is available with autopilot engaged or disengaged. The pilot can always overpower PAARS with the control stick; therefore after activating the PAARS, the control stick must be released or the aircraft will not be able to fly the recovery profile. The minimum recovery altitude is displayed to the pilot. Both CMDIs will revert to the VSD display, and they and the DEP will display the letters ARS and the minimum pullout altitude to the next lower thousand feet. This data is displayed in red on the VSD.

The PAARS is deselected by a second push of the stick ARS switch and/or by activating the disengage paddle switch. If the autopilot or autothrottle were engaged when PAARS was selected, it will stay engaged (with pitch and/or roll no-reference light on) if the PAARS is disengaged with the ARS switch. If the paddle switch is used, the autopilot and autothrottle will be disengaged.

The PAARS is not functional whenever all three of the following conditions are met: A/R door open, bank angle less than ±45° and pitch angle is between -20° and + 25°. It is also not functional with weight-on-wheels and bank angle less than ±20° and pitch angle is between -10° and + 15°.

NOTE

If PAARS is engaged with the landing gear extended, retracting the gear will result in the aircraft reducing pitch by approximately four degrees. If airspeed is less than 200 KCAS, the aircraft may descend as low as the altitude at which PAARS was engaged before resuming climb. To avoid this descent with PAARS engaged, retract the gear above 200 KCAS.

The aircraft recovery response is shown in the PAARS Response Map (see Figure 4-3). The sector boundaries of the Response Map will change slightly if aircraft motion is present (i.e., rolling).

OCIP HUD DISPLAYS

OCIP BASIC HEAD-UP DISPLAY

Refer to Figure 4-4 for the appearance and general location of the following symbol descriptions:

1. Ground Speed

   Ground speed is displayed in knots to within one knot.

2. Heading

   A boxed three-digit readout of magnetic heading is displayed to the nearest degree.

3. Vertical Velocity Scale and Indicator

   The vertical velocity scale displays vertical velocity in feet per minute with a moving indicator against a fixed scale. Major graduations indicate multiples of 1000 feet, and minor graduations indicate odd multiples of 500 feet. The scale represents a range of +1000 to -2000 feet per minute. When the vertical velocity exceeds the scale limits, the pointer remains at the limit position.

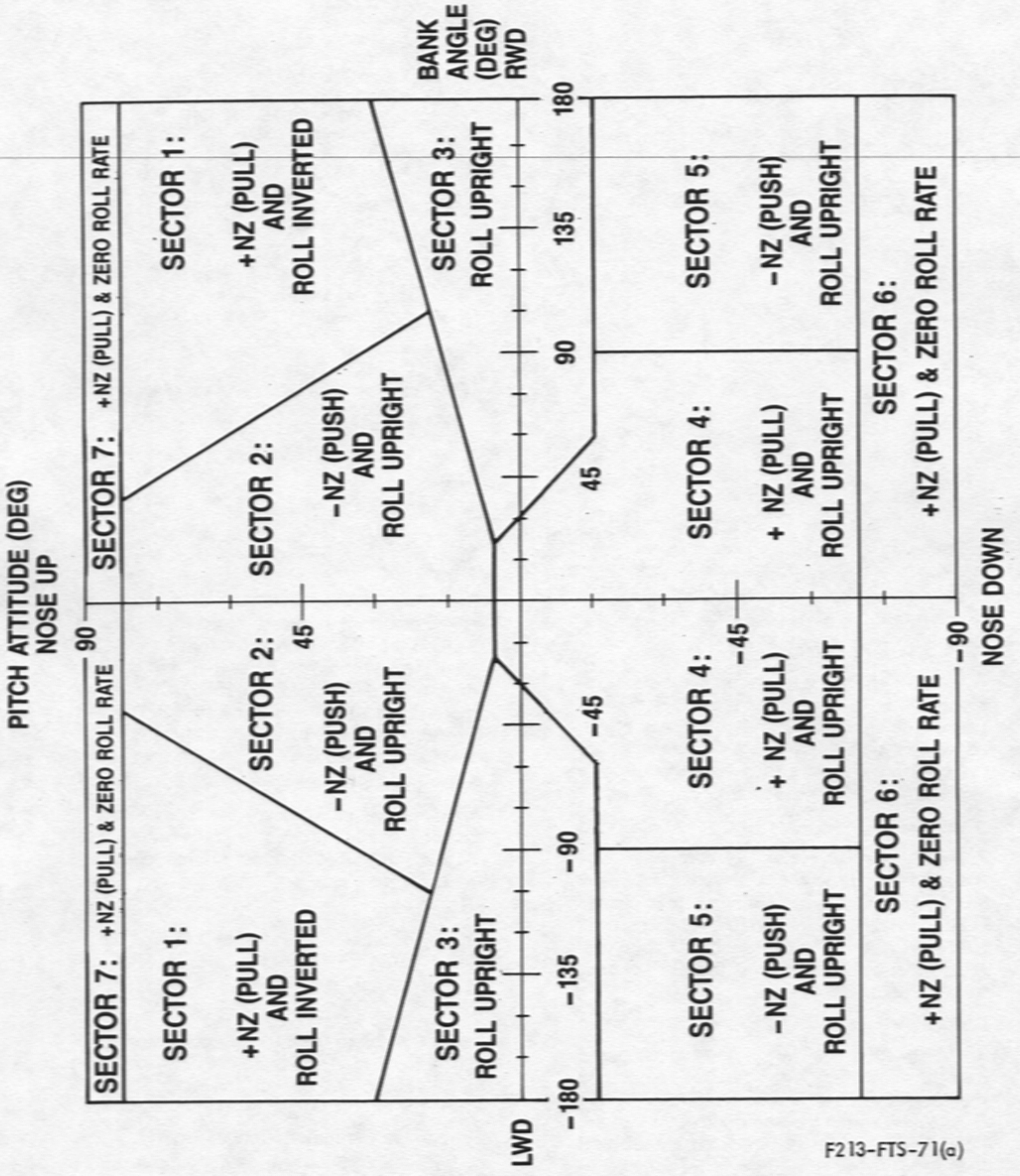
4. Vertical Velocity

   An unboxed digital readout of vertical velocity is displayed to the nearest ten feet per minute. The ones' digit is always zero. When vertical acceleration is greater than 0.667 feet per second per second, the tens' digit is also zero. The readout consists of up to four digits and, in the case of downward velocity, includes a minus sign.

5. Velocity Vector

   The velocity vector displays the inertially derived flight path of the aircraft, except it is not displayed if the INS has failed, or if the Dead Reckoning (DR) mode of navigation is in effect. The velocity vector is free to indicate air craft flight path in both pitch and yaw when the CAGE VV switch on the HUD is in the NORM

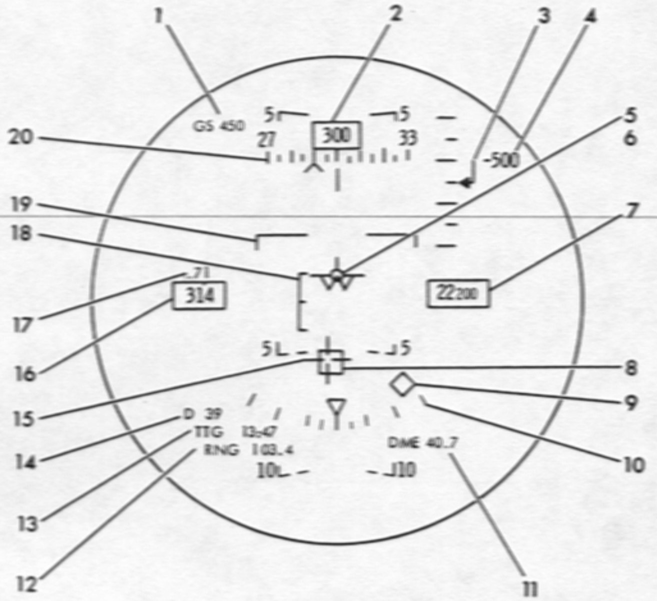
PAARS RESPONSE MAP



F213-FTS-71(a)

FIGURE 4-3

BASIC OCIP HUD DISPLAY



1	GROUNDSPEED
2	HEADING
3	VERTICAL VELOCITY SCALE AND INDICATOR
4	VERTICAL VELOCITY
5	VELOCITY VECTOR (INS OPERATIVE) OR
6	W PITCH REFERENCE SYMBOL (INS INOPERATIVE OR INS DR MODE)
7	ALTITUDE
8	DESTINATION BOX
9	OFFSET AIMPOINT DIAMOND
10	BANK ANGLE AND INDICATOR
11	DME RANGE
12	RANGE
13	TIME TO GO/ETA
14	DESTINATION POINT (D), OR OFFSET AIM POINT (A), OR INVALID OFFSET AIM POINT (X)
15	HUD/IRADS CURSOR
16	AIRSPEED
17	MACH NUMBER
18	APPROACH ANGLE OF ATTACK BRACKET
19	PITCH LADDER
20	HEADING SCALE AND LUBBER LINE

A213-249(d)

FIGURE 4-4

position. It is caged in yaw and free to indicate flight path in pitch only when the CAGE VV switch is in the CAGE position.

6. Pitch Reference Symbol

A fixed W aircraft pitch reference symbol replaces the velocity vector when either the INS fails or the Dead Reckoning mode is in effect. All display elements which were referenced to the velocity vector are then referenced to the aircraft pitch reference symbol.

7. Altitude

A boxed five-digit readout of barometric altitude is displayed to the nearest ten feet. The ones' digit is always zero. When rate of change of altitude is greater than 40 feet per second, the tens' digit is also zero. An occlusion zone prevents other symbols, such as the pitch ladder, from intruding into the box.

8. Destination Box

The destination box is displayed superimposed over the pilot's view of the destination point on the ground, when a valid destination point is in effect and is within the total field of view of the HUD. When the destination is outside the total field of view, but is within the forward hemisphere, the centroid of the box remains at the boundary.

9. Offset Aim Point Diamond

The offset aim point (OAP) diamond is displayed superimposed over the pilot's view of the OAP on the ground, provided that a valid OAP is selected on the throttle switch, and is within the total field of view. When the OAP is outside the total field of view, but is within the forward hemisphere, the centroid of the diamond remains at the boundary.

10. Bank Angle and Indicator

Bank angle is indicated by a moving indicator against a fixed scale. Major graduations are at ± 10, 20, and 30°, and minor graduations are at ± 5°.

11. DME Range

The DME range indicates slant range to the selected TACAN station in nautical miles to the nearest 0.1 nm.

12. Range

Ground range to the current destination is displayed in all modes. Range is displayed in feet for ranges up to 30,000 feet, and in nautical miles within 0.1 nm for ranges exceeding 30,000 feet.

13. Time to Go/Estimated Time of Arrival

In all modes except automatic release attack modes, time-to-go to the current destination or estimated time of arrival, as selected on the

VSD, is displayed to within one second. In automatic release attack modes, time-to-release is displayed to within one second, up to 99 minutes: 59 seconds. In turn-short modes, time-to-turn is displayed.

14. Destination Point/Offset Aim Point

    The number of the current destination point is displayed, prefixed by a D if an offset aim point is not selected on the throttle switch, an A if an offset aim point is selected, and an X if an invalid offset aim point is selected.

15. HUD/IRADS Cursor

    The HUD/IRADS cursor indicates the look angle of the IRADS if the angle is within the total field of view of the HUD. When the angle is outside the total field of view, the centroid of the cursor remains at the boundary.

16. Airspeed

    A boxed three-digit readout of calibrated airspeed (CAS) is displayed to the nearest knot. When the rate of change is greater than 300 KCAS, CAS is displayed to the nearest 5 knots.

17. Mach Number

    A two-digit readout of Mach number is displayed, accurate to two decimal places.

18. Approach Angle of Attack Bracket

    The approach AOA bracket is referenced to the velocity vector so that, when the aircraft AOA is at the optimum value, the middle bar of the bracket is level with the velocity vector wing. When the AOA is 1° greater than optimum, the top of the bracket is level with the wing. When the AOA is 1° less than optimum, the bottom of the bracket is level with the wing. The bracket moves well above or below the velocity vector if the AOA varies greatly from the optimum value. The bracket appears only when the airspeed is decreasing through 200 KCAS and is removed when the airspeed increases through 230 KCAS.

19. Pitch Ladder

    The roll attitude is indicated by rotation of the entire pitch ladder. The horizon bar is projected to overlie the actual horizon when viewed by the pilot. A point which is 4.5° above the center of the display, approximately at the bottom of the heading scale lubber line, is the zero pitch reference point and center of rotation for the pitch ladder.

    Pitch attitude is indicated by movement of the entire pitch ladder in a direction perpendicular to the horizon. Pitch angle reference bars are shown at multiples of 5°. All pitch angle reference bars, including the horizon bar, have a central gap slightly wider than the velocity vector symbol. The inside ends of the pitch ladder bars bend toward the horizon line; the bend varies linearly from 0 to ±45° as the pitch angle varies from 0 to ±45°, and remains a constant ±45° as the pitch angle varies from ±45° to ±90°

20. Heading Scale and Lubber Line

    The heading scale is a horizontal moving display of magnetic heading referenced to a fixed lubber line. Major graduations are multiples of 10°, and minor graduations are at odd multiples of 5°. The most significant two digits of heading are displayed at multiples of 30°.

OCIP HUD DISPLAY – ILS STEERING

The HUD display for the ILS steering mode is shown in Figure 4-5, which includes the following specialized symbols:

1. Drift Corrected Heading Caret

   The drift corrected heading caret is not functional.

2. Bank Steering Bar

   The bank steering bar provides bank steering commands referenced to the velocity vector. The direction of displacement of the bar indicates the direction in which the aircraft should be rolled to establish the desired bank angle. When the desired bank angle is established, the bar is centered on the velocity vector. In level and loft attack modes, the steering bar is elongated to include weapon system cues.

3. Pitch Steering Bar

   In ILS steering mode only, this symbol provides vertical steering commands referenced to the velocity vector. The direction of displacement of the bar from the velocity vector indicates the direction in which the vertical flight path should be corrected to return to the ILS glide slope. When the aircraft is at the commanded pitch angle, the bar is centered on the velocity vector.

   The ILS pitch steering bar displays the pitch command during ILS approaches.

4. TACAN DME

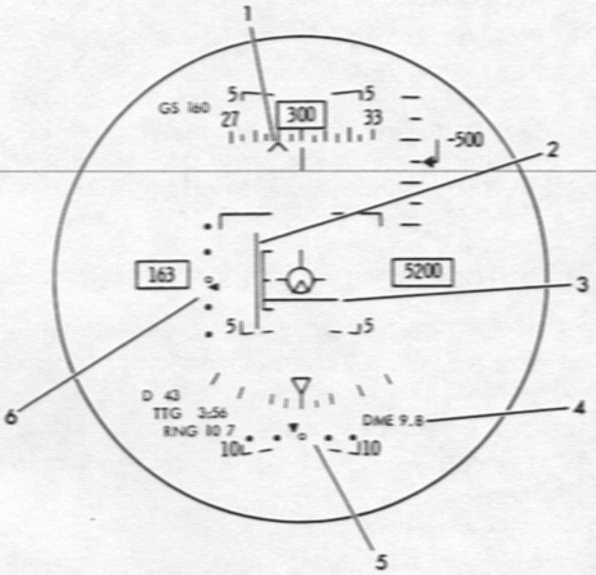
   This digital readout indicates slant range to the selected TACAN station to the nearest 0.1 nm, up to 999.9 nm. The readout is displayed whenever valid DME data are available.

5. Glide Slope Indicator

   The position of the ILS glide slope relative to the aircraft is indicated by a moving pointer against a fixed scale. The center dot represents the glide slope. The inner dots represent 0.25° and the outer dots represent 0.5° deviation from the glide slope.

6. Localizer Deviation Indicator

OCIP HUD DISPLAY – ILS STEERING



1 DRIFT CORRECTED HEADING CARET
2 BANK STEERING BAR
3 PITCH STEERING BAR
4 TACAN DME
5 LOCALIZER DEVIATION INDICATOR
6 GLIDE SLOPE INDICATOR

A213-248(b)

FIGURE 4–5

The position of the ILS localizer inbound course relative to the aircraft is indicated by a moving pointer against a fixed scale. The center dot represents the inbound course. The inner dots represent 1.25° and the outer dots represent 2.5° deviation from the ILS localizer inbound course.

OCIP HUD DISPLAY – TACAN STEERING

The HUD display for TACAN steering is shown in Figure 4-6, which includes the following specialized symbols:

1. Drift Corrected Heading Caret

   In all modes (except manual heading, manual attack, and the no steering mode), this symbol indicates the magnetic heading required to fly a specified course. The drift corrected heading is computed by applying INS–determined wind drift to the commanded/selected course. In the manual heading mode, this symbol indicates the magnetic heading selected by the pilot using the heading select knob located below the left CMDI, or using the DEP. The symbol is removed when the manual attack mode or the no steering mode is selected.

2. Bank Steering Bar

   Same as ILS Steering

3. TACAN DME

   Same as ILS Steering

OCIP HUD DECLUTTER LEVELS

The following symbols and displays are removed from the HUD whenever the declutter 1 or 2 positions are selected by the DCLTR switch which is located below the data entry panel. When the switch is in the NORM position, all the symbols and displays described under HUD–Specialized Displays are shown when appropriate.

DCLTR 1 removes:

a. Ground speed
b. Vertical velocity scale and indicator
c. Destination number and status (D, A, or X)
d. Range display
e. Time to go display

DCLTR 2 removes all items under DCLTR 1 plus:

a. Heading scale and indicator
b. TACAN DME
c. Drift corrected heading caret
d. Bank angle and indicator

When TACAN is selected, the following symbols and displays are removed from the HUD regardless of the position of the HUD declutter switch:

OCIP HUD DISPLAY — TACAN STEERING

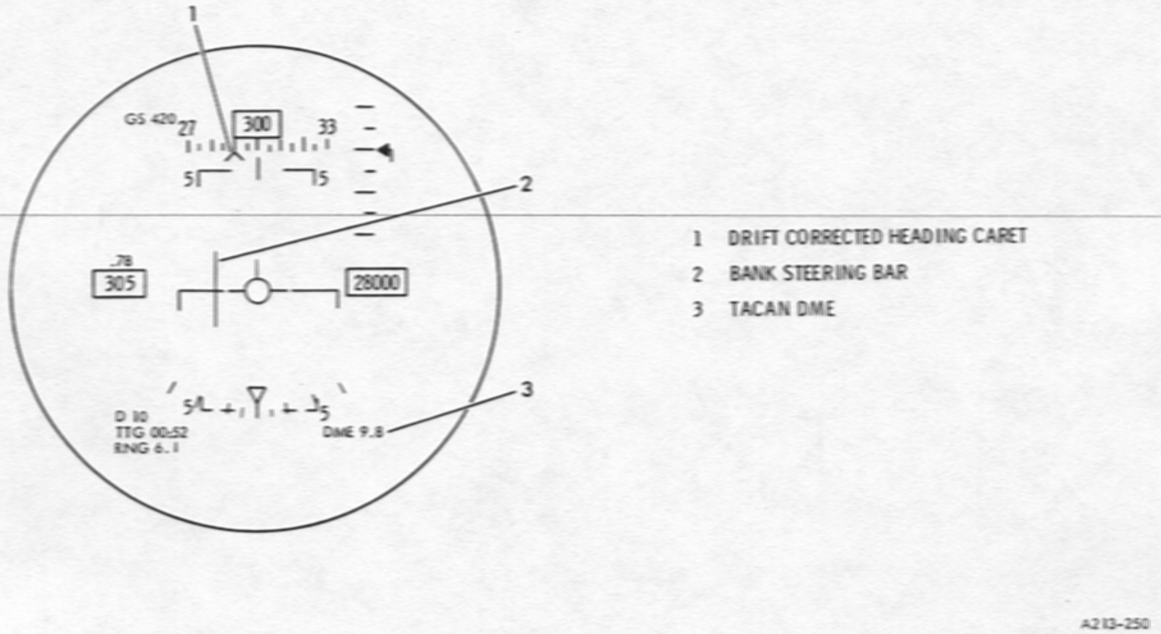


FIGURE 4-6

a. Destination box
b. Offset aim point
c. IRADS line-of-sight
d. IRADS secondary boresight reticle

When ILS is selected, the following symbols and displays are removed from the HUD regardless of the position of the HUD declutter switch:

a. Mach number
b. Destination box
c. Offset aim point
d. IRADS line-of-sight
e. IRADS secondary boresight reticle

OCIP HUD DISPLAY – NAVIGATION STEERING

The HUD display for navigation steering is shown in Figure 4-7, which includes the following specialized symbols:

1. Drift Corrected Heading Caret

   Same as ILS Steering

2. Bank Steering Bar

   Same as ILS Steering

3. TACAN DME

   Same as ILS Steering

4. Out-of Corridor Warning

   With HNAV or VNAV mode active, this symbol is displayed and flashes whenever the aircraft is outside the flight plan corridor. The symbol can be inhibited by pressing the COR switch on the HSD or MAP display.

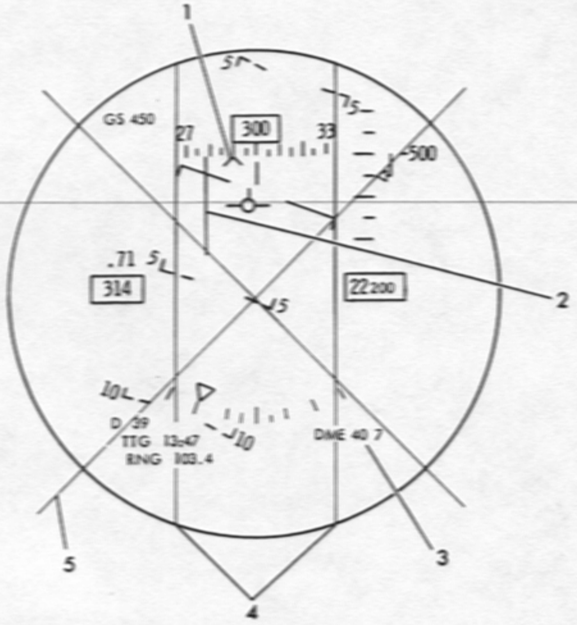
5. Breakaway Cue

   The breakaway cue is a large X which is displayed flashing whenever the barometric reference altitude is at or below the minimum enroute altitude (MEA) for the current TO destination point. The cue can be inhibited by pressing the MEA switch at the top of the VSD.

COLOR MULTIPURPOSE DISPLAY INDICATORS (CMDI)

Two color multipurpose display indicators (CMDI) are installed (see Figure 4-2). The display has twenty push button type legend switches, a brightness (BRT) increase/decrease switch and a contrast (CONT) increase/decrease switch for raster displays, a display symbol brightness (SYMBRT) increase/decrease switch for stroke displays, and a five-position (OFF-NITE-AUTO-DAY-EO) switch.

OCIP HUD DISPLAY - NAVIGATION STEERING



1 DRIFT CORRECTED HEADING CARET
2 BANK STEERING BAR
3 TACAN DME
4 OUT-OF-CORRIDOR WARNING
5 BREAKAWAY CUE

A213-278

FIGURE 4-7

The CMDI can present the VSD, HSD, Map, Edit, Test, Image Data Frame, SMD, Status, Maintenance, Mission, SMS Fault Isolation and IRADS displays. IRADS can be selected only on the left CMDI by positioning the rotary switch to EO. Common data appearing on the VSD, HSD, and SMD are shown in Figure 4-8.

The functions of the CMDI are the same as the MDI described in the F-117A Flight Manual (TO 1f-117A-1) except as noted herein.

MAP DISPLAY

The moving map display provides a capability to monitor the aircraft route of flight, update navigation, view threat locations, and highlight high terrain features. Two modes of operation are available: automatic, where the aircraft reference symbol follows the route of flight; and manual (LOOK or SCROLL) where the throttle slew/designate switch is used to move around the map. Digital Land Map System (DMAP) and paper map (PMAP) data bases are available in both modes. MARK, SNSR, ENTR, and UPDT functions are not available in the manual mode. All map options previously selected are retained upon exiting the map display and remain in effect when returning to the map display. Map options are not retained after engine shutdown. For map symbology see Figure 4-9. See Figure 4-10 for reference to the following text.

1. Out-of-Corridor (COR) Symbol

   When the aircraft is outside the flight plan corridor, an out-of-corridor symbol flashes on the MAP or HSD display. Depressing the COR button removes the flashing symbol and boxes the COR legend. The legend will remain boxed as long as the aircraft is out of the corridor.

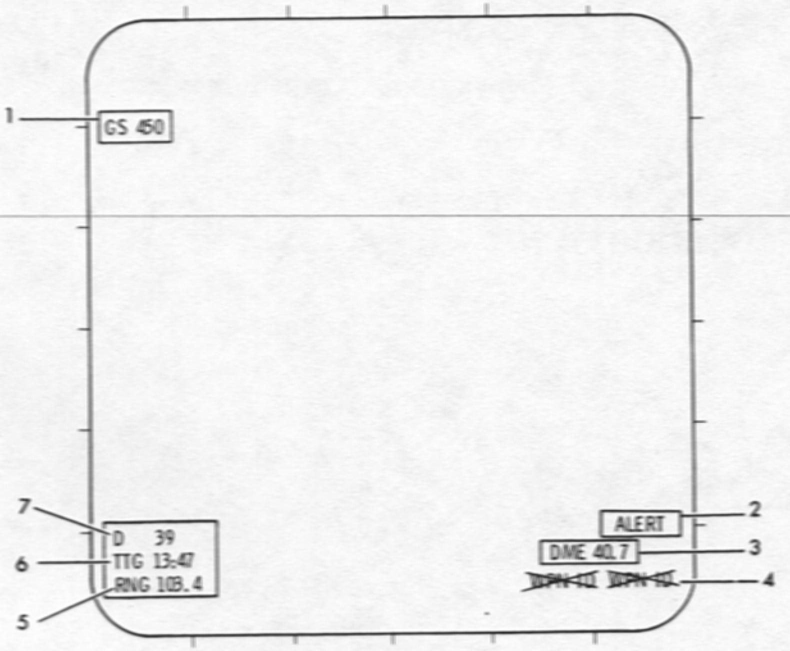
2. Aircraft Reference Symbol

   The aircraft reference symbol represents the INS calculated location of the aircraft on the moving map display. The symbol appears in the automatic mode only, and can either be centered or decentered on the display using the map orientation switch.

3. IRADS Cursor

   The IRADS cursor is displayed in the automatic map mode when the designator select switch is placed in the center (IRADS), up (HUD), or left (MAP) position and the current IRADS line of sight is within the map field of view. The MAP cursor replaces the IRADS cursor when UPDT is boxed and the designator select switch is in the MAP position. The cursor (and IRADS) can be slewed by the throttle slew/designator only when the DSS is in the center (IRADS) or up (HUD) position.

COMMON DISPLAY DATA



1 GROUND SPEED
2 ALERTS
3 TACAN DME
4 WEAPON RELEASE ID/MASTER ARM STATUS
5 CURRENT DESTINATION RANGE
6 CURRENT DESTINATION TIME TO GO
7 CURRENT DESTINATION POINT NUMBER

F213-FTS-64

FIGURE 4-8

4. Threat Location Points

   A maximum number of ten threat location points can appear at a time on the map display. Figure 4-9 lists and defines the threat location points.

5. Map Update Switch

   The map update (UPDT) switch allows for navigation updates provided the IRADS is in MPT or AVT and the designator selector switch is in the left (MAP) position. Pressing the UPDT switch boxes the UPDT legend and the throttle slew switch commands the map cursor movement. The difference between the map cursor and the IRADS line of sight appears in the ground speed readout of the map display. Pressing the ENTR switch completes the navigation update and unboxes the UPDT legend.

6. Map Database Switch

   The map database switch has two positions, PMAP and DMAP. Paper map (PMAP) consists of a database digitalized from photocopying maps such as a TPC. What appears on the display in PMAP is what was on the copied map; therefore there are no allowances for function 1 (map setup) options or map declutter levels in PMAP. DMAP consists of a database from the Defense Mapping Agency's digital files. The files can be altered to meet special needs such as highlighting certain terrain.

7. Course Readout

   The course readout reflects commanded or selected magnetic course.

8. Map Range Switches

   Pressing the switches adjacent to the up or down arrow legends increase or decrease the map range to 10, 25, 50, 100, or 140 nautical miles. The current range appears between the arrows. The default range is 25 nautical miles.

9. Map Orientation Switch

   The map orientation switch has the following four positions:

   - Decenter Track Up (DTUP)
   - Decenter North Up (DNUP)
   - Center Track Up (CTUP)
   - Center North Up (CNUP)

   The decenter position fixes the aircraft reference symbol 75 percent down from the top of the map display. In the center position the aircraft symbol is fixed in the center of the map display.

10. Flight Path

    The flight path represents the route of flight between waypoints. In the automatic map mode, the flight path is color coded for the current and

MAP SYMBOLOGY

ROUTE WAYPOINTS

△ TARGET

◇ OFFSET AIMPOINT

○ NAVIGATION, TAKEOFF, OR INGRESS POINT

□ INITIAL POINT

⬭ AIR REFUELING CONTACT POINT

THREAT LOCATION POINTS

Q	ACQUISITION		
TR	TRACK	5	SA-5
HF	HEIGHT FINDER	6	SA-6
GC	GROUND CONTROL	8	SA-8
C	CROTALE	10	SA-10
R	ROLAND II/RAPIER	11	SA-11
H	HAWK/ I HAWK	12	SA-12
A	23, 30, 57, 76 OR 130 MM	N1	SA-N-1
E	EARLY WARNING	N3	SA-N-3
2	SA-2	N4	SA-N-4
3	SA-3	N6	SA-N-6
4	SA-4	N7	SA-N-7

FIGURE 4-9

next leg, all remaining legs are colored neutral. Red indicates the aircraft is inside the preplanned threat engagement zone, while green indicates the aircraft is outside of the zone. When no data is available the flight path is yellow.

11. Tactical Declutter Switch

The tactical declutter (TDC1) switch allows for multiple selective removal of threat location points, air refueling points, offset aim points, the flight path, and waypoints.

12. Function Switch

The function (FUNC) switch has the following selectable states:

FUNC: non active

FNC1: Map set up options are displayed as noted in Item 13.

13. Background Declutter Switch

The background declutter (BGD) switch controls the selection of area features, sun angle shading, elevation bands and reference elevation. The legend is not boxed in any mode. The default mode displays area features and sun angle shading and removes elevation bands and reference elevation. Selecting any of the three available modes will display (Y) or remove (N) these features as noted.

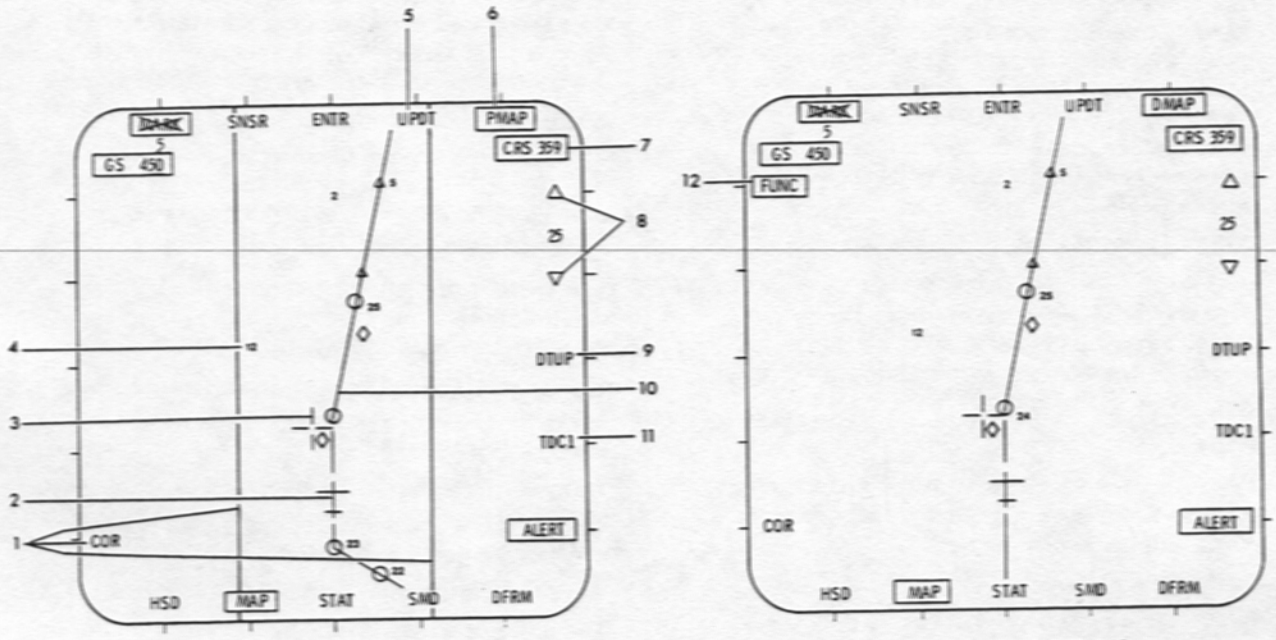
	BGD 1	BGD 2	BGD3
Area Features	Y	Y	Y
Sun Angle Shading	Y	N	N
Elevation Bands	N	Y	Y
Reference Elevation	N	N	Y

Up to eight colors can be depicted for the elevation bands.

14. Reference Elevation Switch

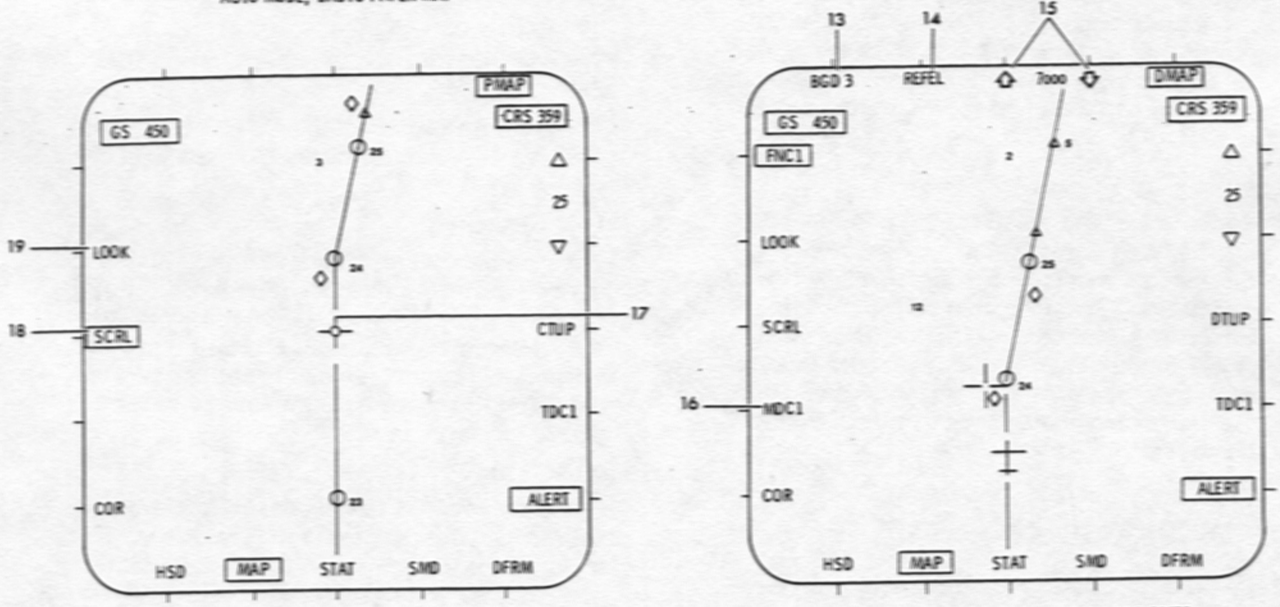
The reference elevation (REFEL) switch (displayed in BGD3) allows alternate selection of automatic or manual reference elevation shading. In the automatic position, the elevation increment arrows are not displayed, the present aircraft altitude will be displayed, and all terrain higher than the aircraft altitude will be shaded in red. If the aircraft altitude is higher than the highest terrain elevation band in the data base, the altitude corresponding to the top of the highest band (rather than aircraft altitude) will be displayed. In the manual mode, the reference elevation readout is displayed between the increment arrows and can be changed with the increment switches. All terrain higher than the displayed reference elevation readout will be shaded in red.

MAP DISPLAY



AUTO MODE, BASIC PAPER MAP

AUTO MODE, BASIC DIGITAL MAP.



MANUAL MODE, BASIC PAPER MAP

AUTO MODE, DLMS MAP, FUNCTION 1 SELECTED

1 OUT OF CORRIDOR SYMBOL
2 AIRCRAFT REFERENCE SYMBOL
3 IRADS CURSOR
4 THREAT LOCATION POINTS
5 MAP UPDATE SWITCH LEGEND
6 MAP DATABASE SWITCH LEGEND
7 COURSE READOUT
8 MAP RANGE SWITCH LEGENDS
9 MAP ORIENTATION SWITCH LEGEND
10 FLIGHT PATH
11 TACTICAL DECLUTTER SWITCH LEGEND
12 FUNCTION SWITCH LEGEND
13 BACKGROUND DECLUTTER SWITCH LEGEND
14 REFERENCE ELEVATION SWITCH LEGEND
15 ELEVATION READOUT SWITCH LEGENDS
16 MAP DECLUTTER SWITCH LEGEND
17 MAP CURSOR
18 SCROLL SWITCH LEGEND
19 LOOK SWITCH LEGEND

FIGURE 4–10

15. Elevation Increment Switches

    The elevation increment switches allow for changing the reference elevation in the manual mode. To change the reference elevation, the display must be in DMAP with FNC 1 and BGD 3 selected. Press the REFEL switch and increase or decrease the reference elevation readout by pressing the increase or decrease arrow switch.

16. Map Declutter Switch

    The map declutter (MDC) switch removes DLMS overlay information from the DMAP display. Pressing the MDC switch removes in 5 selectable levels text, points, linear features, area features, and contour lines.

17. Map Cursor

    The map cursor is present in the manual map mode or when the map update function is used in the automatic map mode.

18. Scroll (SCRL) Switch

    With the DSS in the left (MAP) position, pressing the SCRL switch places the map display in the manual mode (with normal track-up, decenter, etc. options). The map moves underneath the cursor along the preplanned route of flight. Initialization and return are the same as LOOK.

19. LOOK Switch

    With the DSS in the left (MAP) position, pressing the LOOK switch places the map display in the manual mode with a centered North-up orientation. The map moves underneath the cursor as a function of DEP or throttle slew switch inputs. The MAP initializes at (and returns to if the throttle return switch is selected) the destination point selected by the DEP MAP DP menu.

EDIT DISPLAY (CMDI)

The EDIT display allows for reviewing the MDPS generated flight plan. The display is brought up by pressing MAP on the MAP display (or pressing MAP twice from the HSD display). Pressing EDIT on the EDIT display returns the display to MAP. Three consecutive destination points are displayed at one time. Only the middle one may be edited. All data except for destination number and magnetic course may be edited. The displayed waypoint may be changed by the DEST increment button or by entering the desired waypoint number in MAP DP on the DEP. The EDIT display defaults to the current destination point at selection. See Figure 4-11 for reference to the following text.

1. Steering Mode

   The steering mode, destination or courseline, is the navigation steering mode for the turn at that waypoint. The letter OV indicates over fly of the waypoint, blank indicates turn short sequencing.

2. Cursor (CRSR) Increment Arrows

   The (CRSR) increment arrows are used to position the EDIT cursor to the parameter to be changed. The data will be highlighted in cyan.

3. Current Destination

   The current destination indicates the destination point the aircraft is flying to.

4. Destination Increment Arrows

   The destination increment arrows are used to move the waypoint table up or down to select the waypoint for editing.

5. Waypoint/Destination Number

   Identifies the waypoint/destination number of the data available for editing.

6. Waypoint/Destination Number Coordinates

   The latitude and longitude of the waypoint being edited are given in degrees, minutes, and hundredths of a minute.

7. Waypoint/Destination Number Ground Elevation

   The ground elevation of the waypoint is given in feet. A minus sign indicates below sea level elevation.

8. Fuel Remaining

   The planned fuel remaining at time of arrival at a waypoint to the nearest 100 pounds. Editing the fuel at one waypoint automatically updates the fuel remaining at succeeding preplanned waypoints. The fuel remaining and the fuel updates for all subsequent preplanned waypoints will be displayed in yellow.

9. Offset Aim Points (OAP)

   Offset aim points, if available, are presented in the same manner as waypoints. Three Xs appear in the top and bottom waypoints if offset data are present. OAP is fully represented when the waypoint is moved to the center section.

10. Primary Point Indicator

    If estimated time of arrival (ETA) at a waypoint has a P flag, the waypoint is designated a primary time on target waypoint.

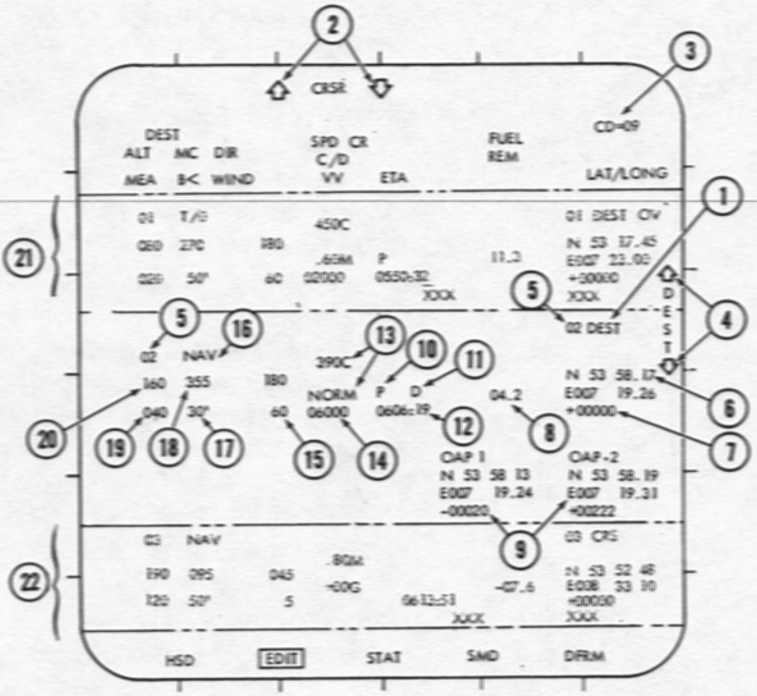
11. Disable Speed Adjustment Capability Indicator

    If the estimated time of arrival at a waypoint has a D flag, the speed adjustment capability for that leg is disabled for the TOT function.

12. Estimated Time of Arrival (ETA)

    The estimated time of arrival at the waypoint.

EDIT DISPLAY



1	STEERING MODE
2	CURSOR INCREMENT ARROWS
3	CURRENT DESTINATION
4	DESTINATION INCREMENT ARROWS
5	WAYPOINT/DESTINATION NUMBER
6	WAYPOINT/DESTINATION COORDINATES
7	WAYPOINT/DESTINATION GROUND ELEVATION
8	FUEL REMAINING
9	OFFSET AIM POINTS DATA
10	PRIMARY TOT POINT INDICATOR
11	DISABLE SPEED ADJUSTMENT CAPABILITY
12	ESTIMATED TIME OF ARRIVAL AT WAYPOINT
13	SPEED COMMAND FOR CRUISE
14	VERTICAL VELOCITY
15	WIND DIRECTION/VELOCITY
16	WAYPOINT TYPE
17	BANK ANGLE
18	MAGNETIC COURSE
19	MINIMUM ENROUTE ALTITUDE
20	AIRCRAFT COMMAND ALTITUDE
21	PRECEDING WAYPOINT INFORMATION
22	FOLLOWING WAYPOINT INFORMATION

F213-FTS-57(e)

FIGURE 4-11

13. Speed Commands

    The speed commands for cruise (top) and/or climb/descent (bottom) are shown in knots or Mach number as appropriate. NORM is displayed when a normal climb (best rate of climb) is planned). DESC is displayed when a maximum range (250 KCAS) descent is planned. Speed command types are indicated by C (KCAS), G (Ground Speed) or M (Mach Number) as specified.

14. Vertical Velocity (VV)

    The climb/descent rate shown in feet per minute.

15. Wind Direction and Velocity

    The wind direction (true) and velocity (kts) is used by the on-board computers to support the time-over-point computations.

16. Waypoint Type

    The waypoint type is data from the MDPS but may be edited by using the DEP and the waypoint cursor.

17. Bank Angle

    The bank angle in degrees is the angle required to make the turn at that waypoint. if the bank angle is other than 30° or 50°, manual control is required, and the displayed angle will be in yellow.

18. Magnetic Course

    The magnetic course required to fly to that designated waypoint. This data cannot be edited.

19. Minimum Enroute Altitude (MEA)

    The minimum enroute altitude is displayed and entered to the nearest hundred feet.

20. Aircraft Commanded Altitude (ALT)

    The aircraft commanded altitude is displayed and entered to the nearest hundred feet.

21. Preceding Waypoint Data

    Data for the waypoint prior to the waypoint being edited. Offset data do not appear.

22. Following Waypoint Information

    Data for the waypoint following the waypoint being edited. Offset data do not appear.

IMAGE DATA FRAME DISPLAY

Selecting the image data frame display (DFRM) presents the menu display shown in Figure 4-12. From the menu, intelligence, approach/departure plates, and other image data can be selected by pressing the switch adjacent to the legend desired. Pressing the forward (FWD) or back (BCK) switch changes the menu display page forward or back. The return (RTN) switch returns the display to the menu's first page.

VSD DISPLAY

The OCIP vertical situation display (VSD) is described in the following text with reference to Figure 4-13.

1. INS Mode Advisory

   The INS mode advisory (ALIGN or INS UP) indicates the status of the INS. The dead reckoning mode is indicated by DR.

2. Icing Condition Advisory

   This indication appears when icing conditions exist, otherwise it remains blank.

3. Calibrated Airspeed Readout

   Displays calibrated airspeed to the nearest knot. When the rate of change is greater than 5 knots/second, calibrated airspeed is displayed to the nearest 5 knots.

4. Mach Number Readout

   Displays Mach number accurate to two decimal places.

5. Airspeed Scale

   Displays the calibrated airspeed on a vertical moving scale.

6. Angle of Attack (AOA) Scale

   A fixed scale calibrated from 0° to 15° with a moving pointer to indicate the AOA. A line at the 9 1/2° mark indicates the optimum approach AOA.

7. Heading Scale

   Indicates the magnetic heading of the aircraft. The fixed lubber line is the heading reference.

8. Heading Readout

   Displays all three digits of the magnetic heading.

9. Minimum Enroute Altitude (MEA) Legend

   The MEA switch allows the pilot to inhibit the breakaway X cue and the voice alert present when the aircraft is at or below the specified MEA for the current destination point.

10. Attitude Indicator

    Shows the aircraft pitch and roll attitudes. The display rotates to show bank angle and the shaded area varies to indicate pitch. Bank and pitch scales are provided for more precise information.

11. Vertical Velocity Scale

    The vertical velocity scale is fixed on the display. A moving pointer indicates the rate of climb or descent and is accurate to within 10 feet per minute.

IMAGE DATA DISPLAY

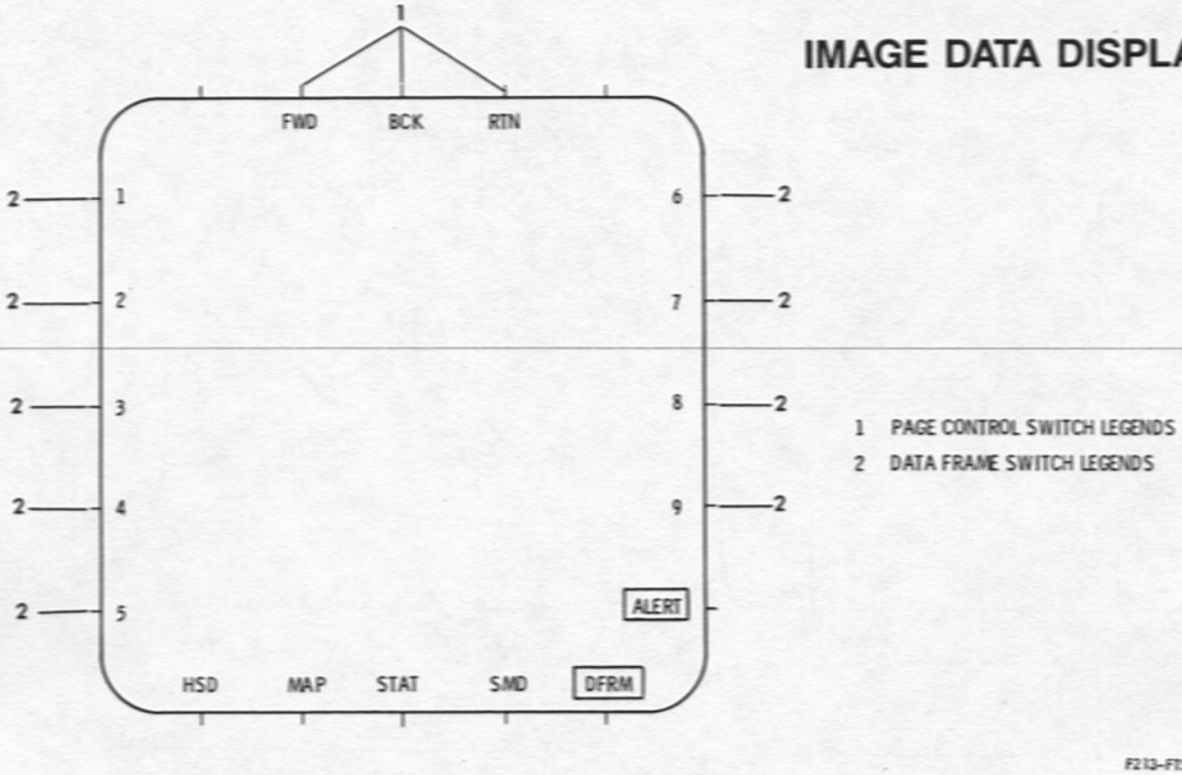


FIGURE 4-12

12. Vertical Velocity Readout

    The four-digit readout shows vertical velocity in feet per minute. It is preceded by a – sign to indicate descent.

13. Altitude Scale

    This scale is a vertical moving display of altitude referenced to a pointer fixed at the middle of the altitude indicator box.

14. Altitude Readout

    This is a boxed five-digit readout with altitude displayed to the nearest 10 feet. At vertical velocities of greater than 2400 feet per minute, altitude is displayed to the nearest hundred feet.

15. Contrail Condition Advisory (CONS)

    This advisory appears when conditions exist that could result in visible contrails; otherwise, this area is blank.

NOTE

The CONS advisory has exhibited erroneous operation and should be ignored.

16. Computer Failure Advisory

    This advisory indicates failure of a weapon system computer. Only the last occurring failure is indicated except that RTB is displayed when the RTB mode is active.

17. TACAN DME Readout

    Indicates the distance in nautical miles to the selected TACAN station.

18. Velocity Vector Switch Legend

    The velocity vector switch alternately selects the velocity vector or the W aircraft reference symbol.

19. Pitch Steering Bar

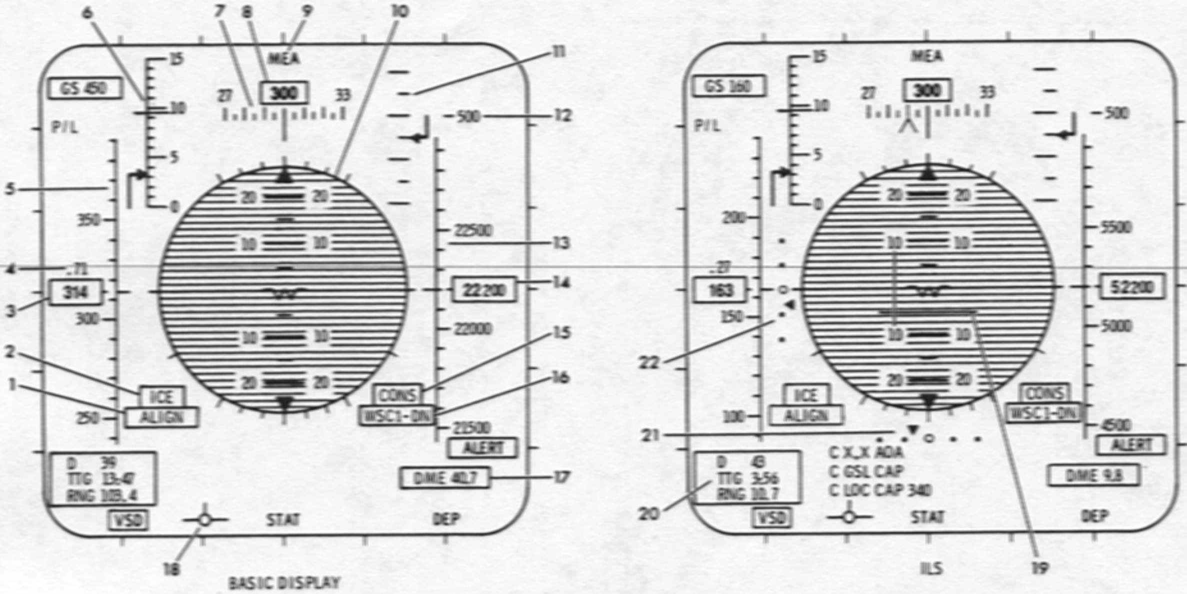
    The pitch steering bar indicates vertical steering commands referenced to the W aircraft reference symbol or velocity vector, whichever is present. This symbol is displayed only in the ILS steering mode.

20. TTG/ETA Display

    In all modes except automatic release attack modes, time-to-go to the current destination is displayed to within one second up to 99 minutes: 59 seconds. The estimated time of arrival is displayed to the nearest second on a 24 hour clock readout.

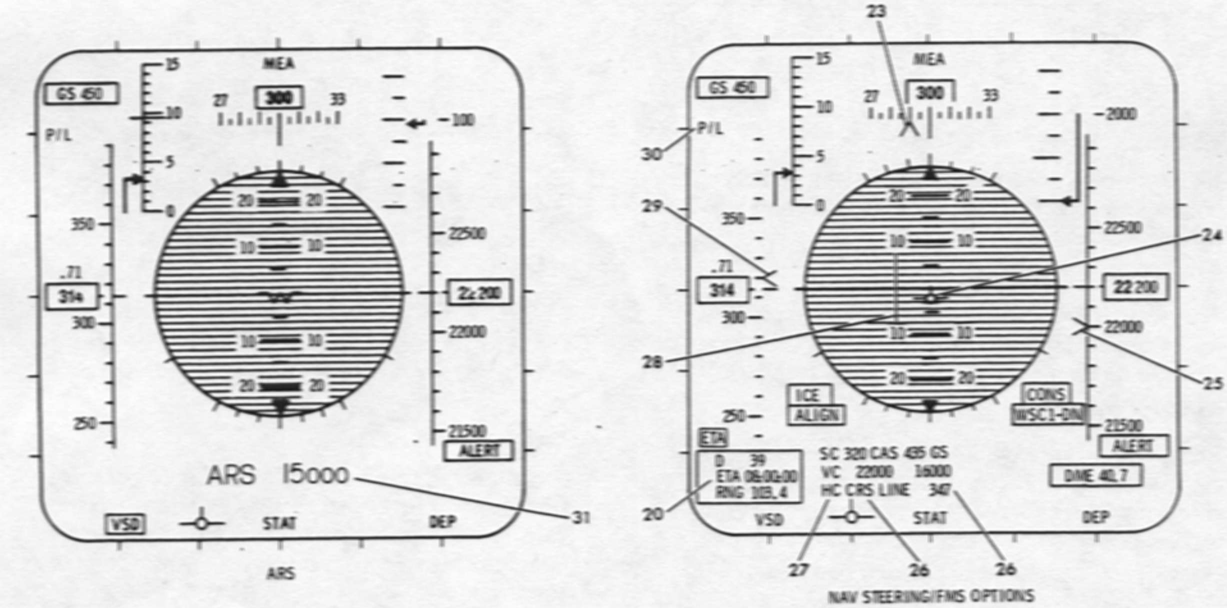
    TTG and ETA values displayed while in any turn-short mode are referenced to the turn point instead of the overfly point TTG and ETA is selectable only on the VSD display but all other displays will display the selected function. The TTG/ETA is calculated with respect to the

VSD



BASIC DISPLAY

ILS



ARS

NAV STEERING/FMS OPTIONS

1	INS MODE ADVISORY
2	ICING CONDITION ADVISORY
3	CALIBRATED AIRSPEED READOUT
4	MACH NUMBER READOUT
5	AIRSPEED SCALE
6	AOA SCALE
7	HEADING SCALE
8	HEADING READOUT
9	BREAKAWAY X/ MEA SWITCH LEGEND
10	ATTITUDE INDICATOR
11	VERTICAL VELOCITY SCALE
12	VERTICAL VELOCITY READOUT
13	ALTITUDE SCALE
14	ALTITUDE SCALE READOUT
15	CONTRAIL CONDITION ADVISORY
16	COMPUTER FAILURE ADVISORY
17	TACAN DME READOUT
18	VELOCITY VECTOR SWITCH LEGEND
19	PITCH STEERING BAR
20	TTG/ETA DISPLAY
21	LOCALIZER DEVIATION INDICATOR
22	GLIDE SLOPE INDICATOR
23	DRIFT CORRECTED HEADING CARET
24	VELOCITY VECTOR SYMBOL
25	ALTITUDE CARET
26	FMS COMMANDS
27	FMS STATUS
28	BANK STEERING BAR
29	AIRSPEED CARET
30	PITCH LADDER SELECTOR
31	ARS INDICATOR

F213-FTS-60(1)

FIGURE 4-13

active steering and is a function of the selected DP overfly point or the calculated turnpoint as shown.

STEER MODE	MISSION PLAN	TTG/ETA WITH RESPECT TO
VNAV/HNAV	TURN-SHORT	TURN POINT
VNAV/HNAV	OVERFLY	DEST POINT
CRS LINE	N/A	TURN POINT
DEST	N/A	DEST POINT
CRS SEL	N/A	DEST POINT
ATTACK	N/A	DEST POINT

NOTE

- If the attack mode is entered from VNAV or HNAV, and the current destination has been planed as a turn-short point, the TTG/ETA will be to the turn point.
- The TTG and ETA on the CDU always refers to the destination, regardless of the steer mode or flight plan selection.

21. Localizer Deviation Indicator

This is a fixed scale with a moving pointer that shows the position of the ILS localizer inbound course relative to the aircraft. The dots are incremented at ±1 1/4°. This symbol is displayed only in the ILS steering mode.

22. Glide Slope Indicator

This symbol indicates the position of the glide slope relative to the aircraft. The dots are incremented at ±1/4°. This symbol is displayed only in the ILS steering mode.

23. Drift Corrected Heading Caret

This symbol indicates the magnetic heading required to fly a specific course. Wind from the INS is applied to the commanded/selected course. In the manual heading mode, this symbol indicates the magnetic heading selected on the auxiliary navigation panel.

24. Vertical Velocity (VV) Symbol

The VV symbol replaces the W aircraft reference symbol and displays the flight path as derived from the INS. The VV symbol shows only the pitch component and is referenced to the horizon line on the attitude indicator. When the pitch angle exceeds ±35° or the bank angle exceeds ±75°; the W aircraft reference symbol and the VV symbol are both displayed and remain until the bank angle returns to ±10° and the pitch angle to ±5°.

25. Altitude Caret

This symbol indicates the FMS commanded altitude for that portion of the programmed flight plan.

26. FMS Commands

When a preplanned mode (VNAV, HNAV SNAV) is active, the speed, altitude, and steering commands for the current leg (left column) and speed, altitude, and course for the next leg (right column) are presented. When a preplanned mode is not active, the left column shows manually commanded speed, altitude, and/or steering, and the right column is blank.

27. FMS Status

The FMS status letters H, V, S, and T indicate HNAV, VNAV, SNAV, and TOT modes of the FMS are active. When no mode is selected, the area remains blank. Coupling one of the modes to the autopilot/autothrottle changes the readout to HC, VC, SC, or TC. During an ILS approach H or V is removed and LOC appears when the localizer is captured and ALT appears when the autopilot/autothrottle engages. After coupling the ILS steering mode to the autopilot/autothrottle and localizer the readout becomes C LOC.

28. Bank Steering Bar

This symbol indicates the bank steering commands referenced to the W aircraft reference symbol or velocity vector.

29. Airspeed Caret

This symbol indicates the FMS commanded airspeed for that portion of the programmed flight plan.

30. Pitch Ladder Selector

This switch provides selection of the pitch ladder display or attitude sphere display. With the pitch ladder display selected (P/L boxed), all display elements except those associated with the altitude sphere are retained.

31. ARS Indication

The automatic recovery system (ARS) minimum pullout altitude appears in feet above mean sea level as computed by the NIAC. Selection of ARS blanks out the digital readout, steering bars, drift corrected heading caret, weapon release IDs, FMS status, command bugs, ICE advisory, and CONS advisory. Deselection of ARS restores the blanked data to the display.

HSD DISPLAY

The appearance and general location of the symbols on the HSD are shown in Figure 4-14.

1. Ground Speed Display

   The ground speed (GS) display is a digital readout of inertially derived ground speed displayed to the nearest knot.

2. Upper Switch Legends

   The SNSR legend is used for sensor update. The MARK legend is used to store coordinates in destination 94 through 98. If all conditions to enter a MARK point are not satisfied, an X will appear over the legend and will not be removed until all requirements are satisfied or the MARK function is deselected. The ENTR button is used to enter the MARK point. The number of remaining MARK points is displayed continuously under the legend.

3. Lubber Line and Aircraft Symbol

   The lubber line and aircraft symbol are fixed on the display, and are used to reference the compass card and course pointer, respectively.

4. Course Preselect Box and Course

   The CRS SEL, TCN, or ILS steering mode is selected on the DEP and the corresponding CRS SEL, TACAN, or ILS LOC legend is automatically displayed in the preselect box in the upper right corner of the HSD. Prior to selecting one of these steering modes, the course may be preselected by pressing the switch adjacent to the course preselect box and then adjusting the course using the CRS knob on the auxiliary navigation panel. The course is displayed in a three-digit readout below the box.

5. Compass Card

   The compass card is a circular scale which rotates to display airplane magnetic heading beneath a lubber line fixed at the top of the display. The scale is broken into 10° segments by long tick marks, while 5° increments are shown by shorter marks. Compass headings are shown with the most significant two digits placed every 30°, except at the cardinal points, where N, S, E and W appear. As the compass card rotates, these numerals remain oriented to the bottom of the display.

6. Equipment Failure Alert

   The equipment failure alert, boxed in yellow, appears in the area indicated by ALERT to warn the pilot of weapon system related failures (Refer to Section III). Up to three alerts are recalled by pressing the adjacent CMDI switch. The last alert is cleared by pressing the switch again.

7. Lower Switch Legends

   The active format is indicated by a green box around the legend.

8. Drift Corrected Heading Caret

   The wind drift corrected heading caret is an open arrowhead which indicates magnetic heading required to fly a specified course. In all modes except MAN HDG and MAN attack, the INS determined wind drift is applied to the selected course to produce the drift corrected heading caret. In the MAN attack and MAN HDG modes, the caret is not present. The caret is positioned outside the compass card so that when it is aligned with the lubber line, an arrowhead is formed at the top of the display.

9. Destination Pointer

   The destination pointer is a hollow diamond shaped figure with a short tail. It is displayed inside the compass card, and points at the magnetic bearing to the current selected TO destination point.

10. TACAN Bearing Pointer

    The TACAN bearing pointer is made up of a hollow triangular head, and a hollow rectangular tail. The pointer is displayed inside the compass card, and points at the magnetic bearing to the selected TACAN station.

11. Course Readout

    The course readout is displayed in all modes. It provides a three-digit readout of the course pointer direction referenced to magnetic north.

12. Course Pointer

    The course pointer is the large arrow across the compass rose which indicates a selected or commanded magnetic course. In DEST, CRS LINE, LVL and LOFT modes, the course pointer is positioned automatically by the system. In manual attack, CRS SEL, TCN, and ILS modes, the pilot positions the course pointer by means of the course knob located on the auxiliary navigation panel, or on the proper DEP keypad.

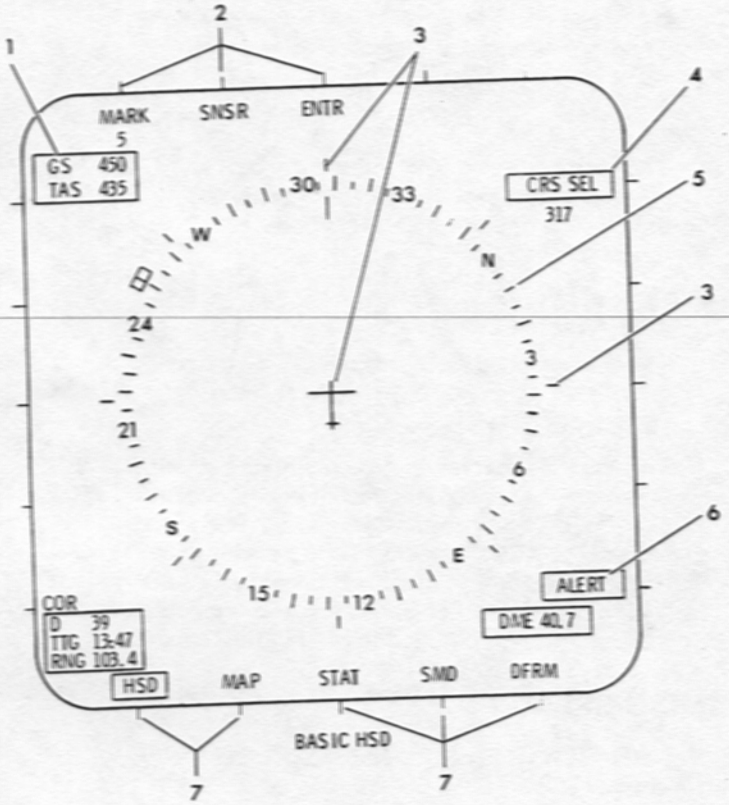
13. Course Deviation Indicator

    The course deviation indicator is displayed in all modes except manual heading and manual attack. It is the center portion of the course pointer arrow. In the INS steering mode, the course deviation indicator indicates lateral displacement from the selected course.

14. Deviation Scale

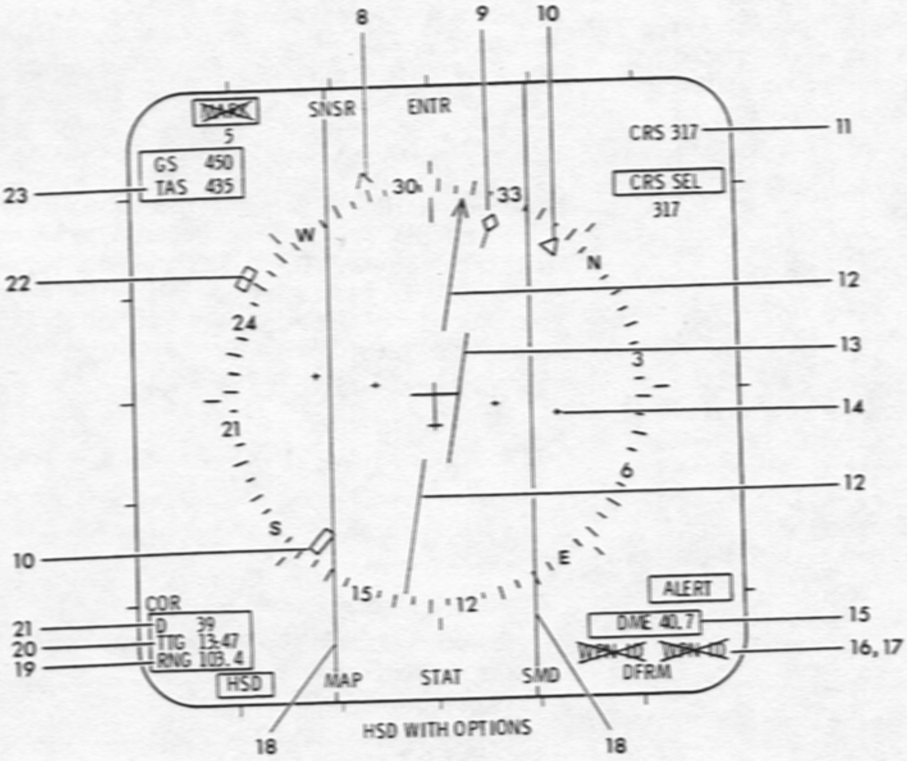
    The deviation scale consists of four dots, with two dots evenly spaced on each side of the course line pointer. The dots serve as a scale indication for determining deviation indicated by the course deviation bar. The scale of the deviation dots varies with the selected steering mode. In the INS steering mode, the dots represent ±3 and ±6 nm lateral displacement from the selected course. In the TACAN steering

HSD



BASIC HSD

1	GROUND SPEED DISPLAY
2	UPPER SWITCH LEGENDS
3	LUBBER LINE AND AIRCRAFT SYMBOL
4	COURSE PRESELECT BOX AND COURSE
5	COMPASS CARD
6	EQUIPMENT FAILURE ALERT
7	LOWER SWITCH LEGENDS
8	DRIFT CORRECTED HEADING CARET
9	DESTINATION POINTER
10	TACAN BEARING POINTER
11	COURSE READOUT
12	COURSE POINTER
13	COURSE DEVIATION INDICATOR
14	DEVIATION SCALE
15	TACAN DME
16	WEAPON ID
17	MASTER ARM STATUS
18	OUT-OF-CORRIDOR WARNING SYMBOL
19	RANGE DISPLAY
20	TIME TO GO DISPLAY
21	DESTINATION POINT NUMBER
22	HEADING MARKER
23	TRUE AIRSPEED DISPLAY



HSD WITH OPTIONS

F213-FTS-62(c)

FIGURE 4-14

mode, the dots represent ± 5° and ± 10° angular deviation from the selected course. If the ILS steering mode is selected, the dots nominally represent ± 1 1/4° and ± 2 1/2° of angular deviation from the final inbound course. If an attack steering mode is selected, the dots represent ± 3 and ± 6 nm cross-track miss distance.

15. TACAN DME

The TACAN DME is a digital readout of slant range to the selected TACAN station. It is presented to the nearest one-tenth of a nautical mile up to 999.9 miles.

NOTE

- If a sensor or visual update is performed, the TAS and DME values on the HSD and tactical plot are replaced by the update bearing, range, and altitude correction vector values. The TAS and DME values are redisplayed, and the correction vector values are removed when the update switch is deselected.
- Refer to F-117A Utility Nonnuclear Weapons Delivery Manual (TO 1F-117A-34-1) for a description of items 16 and 17.

18. Out-of-Corridor Warning

With HNAV or VNAV active, this symbol is displayed and flashes whenever the aircraft is outside the flight plan corridor. This symbol is removed when the COR button is pressed. A white box around the COR legend indicates that the out-of-corridor warning is inhibited.

19. Range Display

The range display (RNG) is a digital readout of range to the selected INS destination and is present in all navigation and attack modes. Range is displayed in feet up to 30,000 feet, and then changes to nautical miles displayed to the nearest one-tenth of a mile.

20. Time To Go Display

The time to go (TTG) display is a digital readout of the time to go to the selected INS destination or to weapon release if in an automatic release attack mode. It is present in all navigation and attack modes. Time is displayed in minutes and seconds to within one second, up to 99 minutes: 59 seconds. In turn-short mode, the time to go is the time to turn initiation.

21. Destination Point Number

The number of the correctly selected TO destination point is displayed in the lower left corner of the display with a D preceding it if an offset aimpoint is not selected on the throttle, an A if an offset is selected, or an X if an offset is selected but not defined. If the X is displayed, the TO destination point coordinates are used.

NOTE

The course deviation indicator, course pointer, and course window are displayed only if a navigation or attack mode is selected on the DEP

22. True Airspeed Display

The true airspeed (TAS) display is a digital readout of true airspeed to the nearest knot.

23. Heading Marker

The heading marker is a rectangular box with vertical bars at its center which is positioned outside the compass card. The marker is rotated around the card by means of the heading select knob located on the auxiliary navigation panel. The heading marker indicates the magnetic heading to be maintained in MAN HDG mode.

SMD DISPLAY

Refer to F-117A Utility Nonnuclear Weapons Delivery Manual (TO 1F-117A-34-1).

STATUS DISPLAY

The status display indicates the operational state of the aircraft avionic system. The maintenance, mission, and SMS fault isolation formats are sub-formats of the status display. The maintenance format displays all subsystems and line replaceable units (LRUs) regardless of failure status.

The mission format depicts what disk drive cartridge (DDC) and EDTM have been loaded. When a mismatch occurs a mission ID no match message appears on the main status display and the mission format display. The SMS fault isolation display indicates system failure within the stores management processors.

Refer to Figure 4-15 for the following:

1. Fault Information

This area displays subsystems that have faults.

2. Maintenance Display Switch Legend

This switch, when pressed, displays the maintenance format.

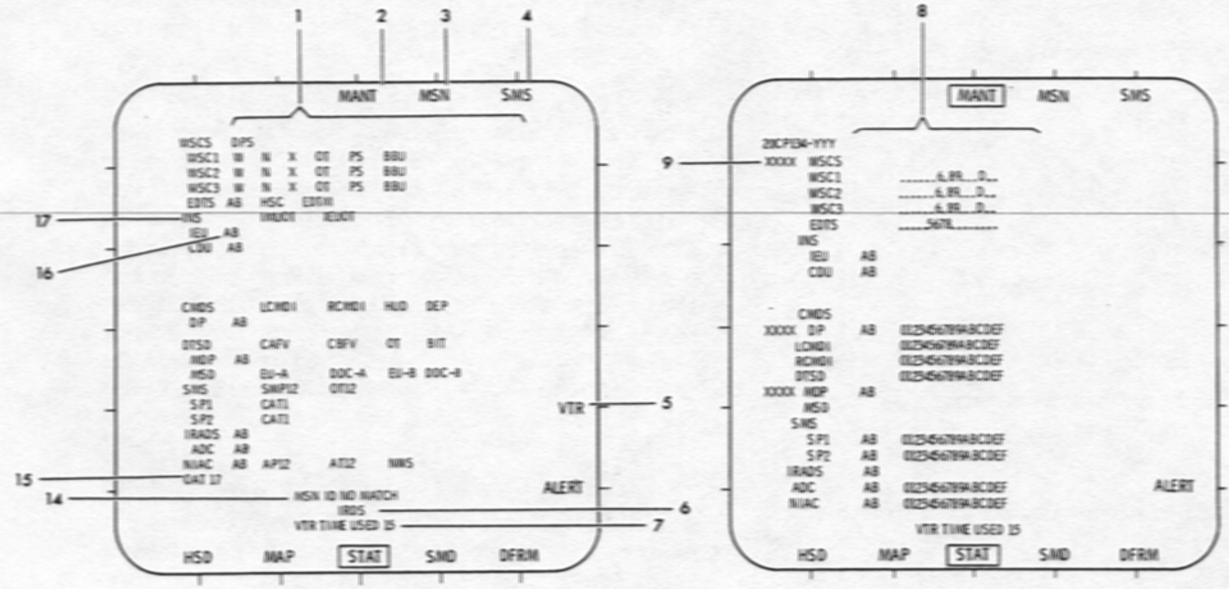
3. Mission Display Switch

Selection of the mission display switch brings up the mission format.

4. SMS Format Display Switch

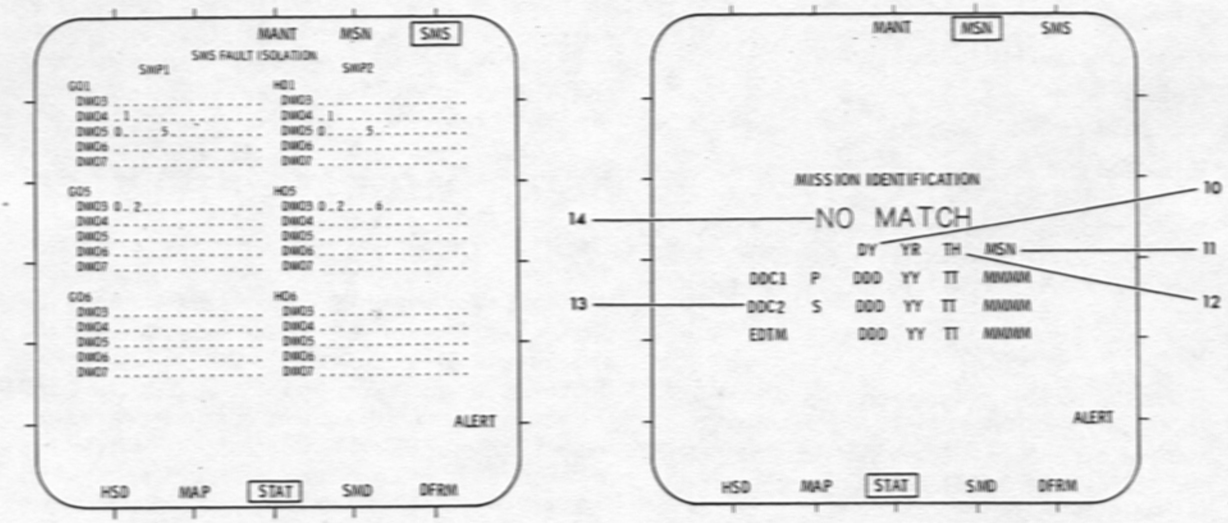
Pressing this switch displays the stores management system fault isolation format.

STATUS DISPLAY



STATUS FORMAT

MAINTENANCE FORMAT



SMS FAULT ISOLATION FORMAT

MISSION FORMAT

1 FAULT INFORMATION
2 MAINTENANCE DISPLAY SWITCH LEGEND
3 MISSION DISPLAY SWITCH LEGEND
4 SMS FORMAT DISPLAY SWITCH LEGEND
5 VTR SOURCE SELECT SWITCH LEGEND
6 VTR SOURCE INDICATION
7 VTR TIME USED
8 FAULT ISOLATION INFORMATION
9 MEMORY CONFIGURATION

10 PREPARATION DATE
11 THEATER NUMBER
12 MISSION NUMBER
13 LINE REPLACEABLE UNIT (LRU)
14 MISMATCH ADVISORY
15 OUTSIDE AIR TEMPERATURE (CENTIGRADE)
16 BUS FAULT
17 SUBSYSTEM/LRU FAULT

F213-FTS-54(b)

FIGURE 4–15

5. Video Tape Recorder (VTR) Source Select Switch

   Pressing the VTR selects the source the VTR is to record from (IRADS or HUD camera). IRADS is the default source.

6. VTR Source Indication

   The current VTR source selected appears as IRDS or HUD.

7. VTR Time Used

   Indicates the time the VTR has been recording.

8. Fault Isolation Information

   Used on the maintenance display to isolate the fault.

9. Memory Configuration

   Used on the maintenance display to indicate the software configuration.

10. Preparation Date

    Used on the mission display to indicate the year (2 digits) and date (3 digits) that the disk drive cartridge (DDC) was prepared.

11. Theatre Number

    The theatre number (mission display) consists of two digits.

12. Mission Number

    The mission number (mission display) consists of four digits.

13. Line Replaceable Unit (LRU)

    Presented are the two disk drive cartridges (DDC) and EDTM. The DDCs are identified on the mission display as 1 or 2 and indicate which one is primary (P) and secondary (S). Shown for each unit is the preparation date, theatre number, and mission number.

14. Mismatch Advisory

    When the theatre and mission numbers of the DDCs and EDTM do not match, a NO MATCH message appears on the mission format display and MSN ID NO MATCH message appears on the main status display.

15. Outside Air Temperature (OAT)

    Indicates outside air temperature in degrees centigrade.

16. Bus Fault

    Indicates a failure of the subsystem to communicate on the A and/or B bus.

17. Subsystem/LRU Fault

    Displays the subsystem or LRU that indicates a fault.

FLIGHT ATTITUDE AWARENESS DISPLAY (FAAD)

The Flight Attitude Awareness Display provides situational attitude information during head down cockpit operations by presenting flight attitude symbology on the Sensor Display (SD).

The FAAD symbology consists of a pitch ladder displayed in the upper right hand area of the Sensor Display (see Figure 4–16). The pitch ladder moves in the same way the HUD pitch ladder moves in pitch and roll. The pitch lines are displayed in 5° increments from -90° to + 90° and four to six pitch lines are displayed at a time. The positive pitch lines are solid and the negative pitch lines are dashed with the outer segments pointing towards the horizon. The Velocity Vector (VV) will be displayed, when data is available, relative to the FAAD and is caged all the time. When VV data is not available, the W aircraft reference symbol is displayed.

The FAAD is displayed at all times. No provisions for de– clutter are provided. Intensity adjustments are made by selecting the Status Display and using the bezel buttons adjacent to the FAAD increment arrows. Intensity levels are indicated numerically on the Status Display and are changed incrementally with single pushbutton depressions.

Under certain conditions, the Display Processor (DP) can revert to a back–up video mode (see Figure 4–16). In this mode, the sensor display shows only the NAV and ALT not–engaged advisories and will not display the FAAD symbology.

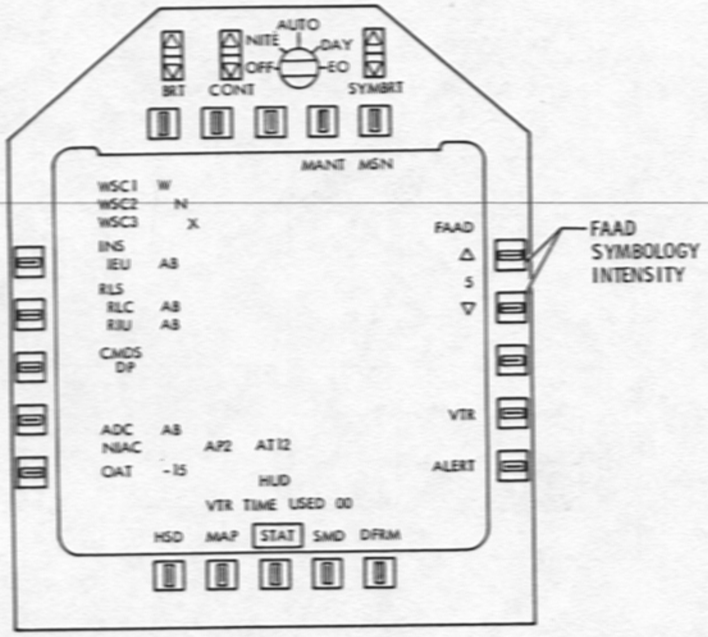
RETURN–TO–BASE (RTB) MODE

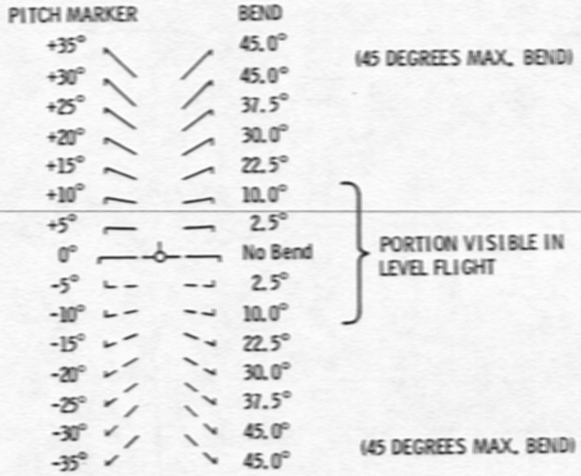
The RTB (return–to–base) mode is a degraded software configuration where the system has failed such that both the navigation functions and the weapon/display functions cannot be fully supported and the mission cannot be completed. The software preserves the navigation and navigation steering functions, and the basic displays and controls, but does not provide weapon sensor, FMS, and other supporting functions not required to safely return–to–base. Degraded resources following various computer failures are shown in Figure 4–17.

Where RTB is indicated, the following functions are available.

a. All N–WSC (WSC 2) functions
b. Basic HSD, VSD, and HUD displays
c. DEP selection of all horizontal navigation steering modes (MAN HDG, ILS, TCN, CRS SEL, DEST STR, and CRS LINE) if the INS is operative
d. CAS Hold

FAAD DISPLAY SYMBOLOGY



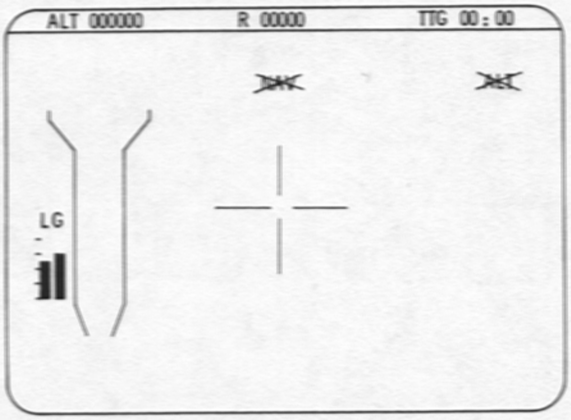


PITCH MARKER	BEND
+35°	45.0°
+30°	45.0°
+25°	37.5°
+20°	30.0°
+15°	22.5°
+10°	10.0°
+5°	2.5°
0°	No Bend
-5°	2.5°
-10°	10.0°
-15°	22.5°
-20°	30.0°
-25°	37.5°
-30°	45.0°
-35°	45.0°

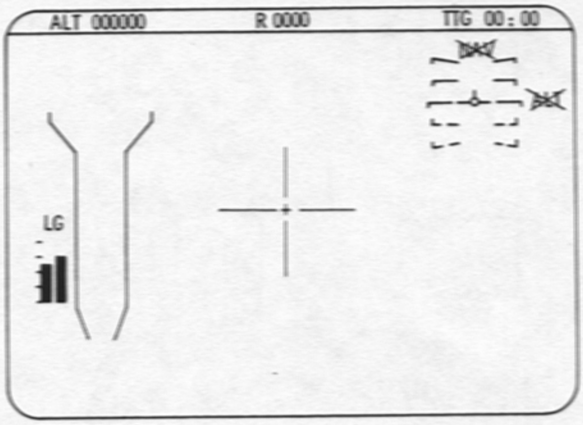
NOTE

The bend of the pitch lines are as follows:

Pitch Line	Degree of Bend
5 degrees	0.5 deg. bend / 1 deg. pitch
10 degrees	1.0 deg. bend / 1 deg. pitch
15 degrees and subsequent	1.5 deg. bend / 1 deg. pitch up to 45 deg. od bend



SENSOR DISPLAY BACKUP VIDEO MODE

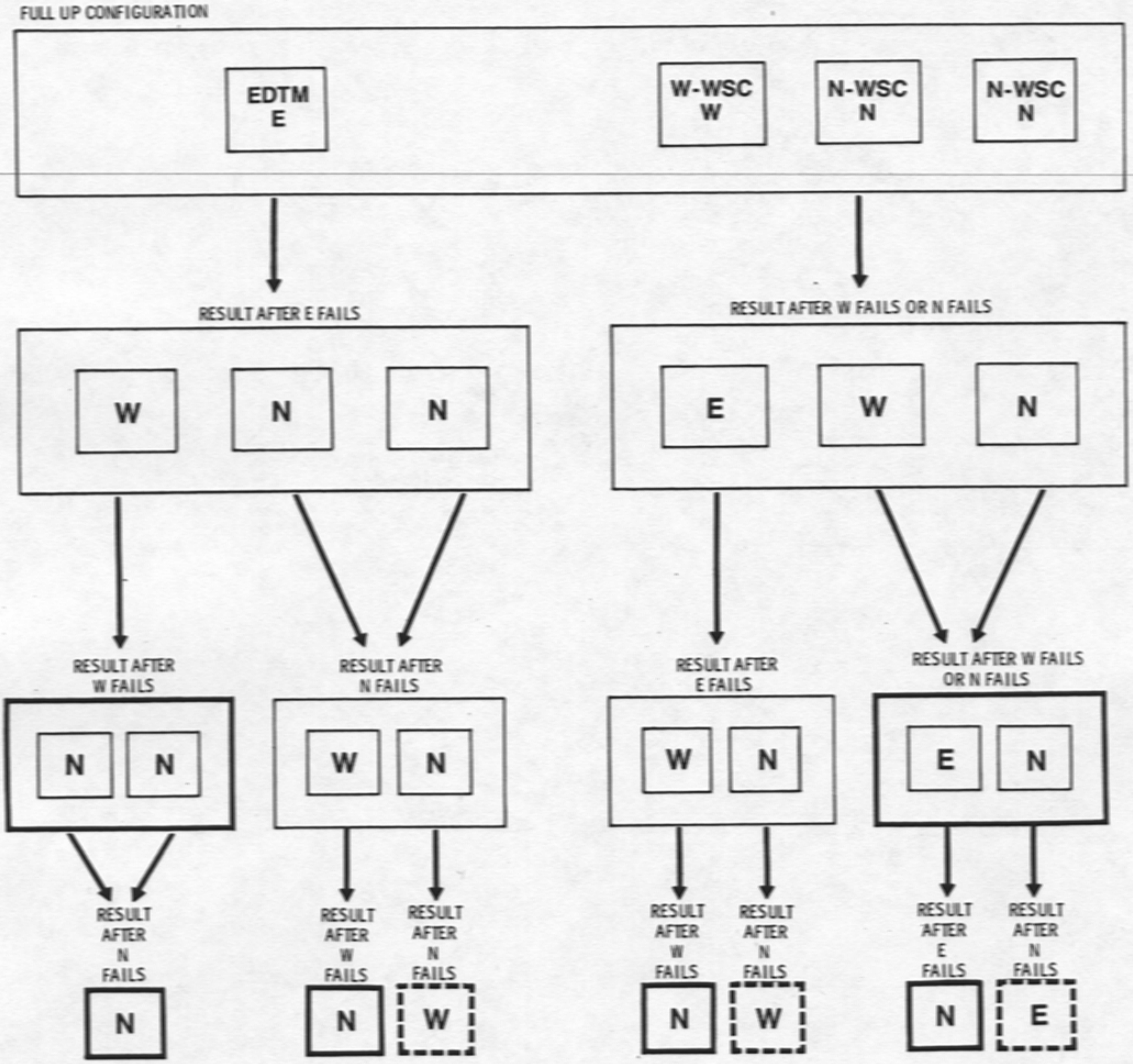


SENSOR DISPLAY

F213-FTS-73(c)

FIGURE 4-16

COMPUTER RESOURCES FAILURE DIAGRAM



NOTES

1 Return-To-Base configuration indicated by heavy border.

2 Dashed border indicates no RTB capability. Backup instruments and NIAC modes available.

3 The computer configuration (W or N) is determined by the function, Weapons or Navigation, residing in that computer. The Expanded Data Transfer Module (EDTM) is denoted by the letter E.

A213-276(a)

FIGURE 4-17

e. ILS glideslope bank and pitch steering bars
f. Advisories
g. Altitude Hold
h. Aux nav panel course and heading input
i. Steering select switch
j. MEA indication/switch
k. ARS indication/minimum recovery altitude

The following functions are not available:

On the DEP:

a. SNAV, VNAV, HNAV, or TOT
b. Speed select option (including TOP)
c. Attack modes
d. RLS
e. Track change (on CDU only)
f. Destination select
g. VTR
h. IRADS control (manual mode only)
l. Altitude Select
j. Keypad
k. Edit
l. ARS (VSD only)

On the Displays:

a. SMD
b. Status
c. Test
d. Maintenance
e. Edit
f. Map
g. Sensor (IRADS) (manual mode only)
h. On Board Fault Monitor (OBFM)
l. HSD SNSR, MARK, ENTR, MAP, STAT, SMD or DFRM legends, weapon status, alerts
j. VSD velocity vector switch, switch legends (except VSD, HSD, MEA and DEP), weapon status, alerts
k. HUD/IRADS cursor, weapon status, declutter control, OAP diamond, destination box, VV cage, MEA breakaway cue

SAFE CORRIDOR

The MDPS defines a safe corridor for the entire mission via the EDTM. The corridor represents the safe horizontal distance on either side of the planned route. When a destination point is overflown, the safe corridor is augmented by the area within a radius of five nautical miles of the destination point.

The allowed planned steering zone is defined by the corridor width along the course between the current waypoint and the previous waypoint. Also allowable are areas within circles of five nautical miles radius from the current waypoint, and from the previous waypoint if cases arise where they are not already allowed by the corridor width segments.

If the aircraft should exit the allowed planned steering zone, the following occurs:

a. Automatic descents of more than 200 feet are not permitted.
b. A flashing out-of-corridor symbol appears on HSD, MAP and HUD displays.
c. COR alert appears on HSD and MAP displays.

Inflight, if a track change is initiated while planned steering is engaged, and the aircraft exits the safe corridor to the new destination, the out-of-zone indications occur.

On the ground, if the pilot initiates a track change to review planned mission data, the out-of-zone indications do not occur.

DATA ENTRY PANEL (DEP)

The DEP (see Figure FO-3) provides a means to select FMS, A/P, and A/T modes, edit the flight plan, track change the INS, select the destination of interest for manual maps and waypoint editing, and control video recorder and IRADS functions. The main menu, submenus, and keypads are shown in Figure FO-3.

GENERAL RULES

The mode select buttons (bezels), located above and below the display area, are used to select the mode available on the DEP (see Figure FO-3). The characters are normally white on a dark background when the mode is not engaged. The mode engaged status is indicated by black characters with a white background (reverse video).

M V	Mode is not active. Mode and value are selected by pressing mode button.
M V	Mode is active. Value shown is the preselect value. Active value is shown on the VSD. Pressing the mode button activates the preselect value and returns to the main menu.
M V	Mode and value are active. Pressing mode button deselects that mode and returns to main menu.

Selecting a mode on the DEP will cause a submenu or keypad to appear. A submenu provides for selection of a specific altitude, speed, or steering mode. Pressing a specific mode button or the EXIT button on the submenu will return the main menu to the DEP display. Pressing a value will cause a keypad to appear. That value appears on the status line and can be changed by using the keypad numbers. The upper left block of the keypad is blank until any digit is pressed, then CLR appears. The first push of the CLR button clears the last digit entered. The second push returns the keypad to the previous preselected value. Pressing ENTR engages both the mode and the value shown on the status line and returns the main menu to the DEP display. Pressing EXIT establishes that value as the preselect value and returns the main menu to the DEP display, but does not engage that value.

NOTE

On the speed and altitude menu, a preselect value may be entered (by pressing EXIT) in the active mode without changing the active value. In this case, the current value is displayed on the VSD and the preselect on the DEP menus. The steer modes work differently; entry of a new value for an active mode, followed by EXIT, retains the old (active) value on the steer menu, but puts the new (preselect) value on the key pad status line.

UNPLANNED AUTOPILOT/AUTOTHROTTLE MODES

Unplanned modes are those that are selected by the pilot independent of the EDTM mission data. These are altitude select and hold, speed select and hold, steering, and attack modes. Attack modes are described in F-117A Utility Nonnuclear Weapons Delivery Manual (TO 1F-117A-34-1).

ALTITUDE MODE

The DEP altitude menu is selected from the main menu by pressing the ALT switch (refer to Figure FO-3).

Altitude may be held or selected with or without autothrottle. With manual throttle, climbs will be made at best rate-of-climb speed or CAS at engagement, whichever is slower. Descents will be at CAS at engagement; and rate of climb/descent will be a function of throttle setting. With autothrottle, climbs will be at maximum thrust at the speed command or best rate-of-climb speed, whichever is slower. Descents will be made at idle thrust, at the speed command. With autothrottle, climb angle is limited to 12° and descent angle is limited to 18°.

To enter altitude hold:

1. Engage the autopilot (autothrottle as desired). The HOLD legend on the altitude menu will not appear if the autopilot is not engaged.
2. On the DEP altitude menu, press HOLD. The A/P PITCH no reference light will come on steady (if an altitude mode was not already engaged). If an altitude mode was engaged, the altitude hold mode is selected and engaged at the current altitude and the A/P PITCH no reference light will remain off.
3. When at the desired altitude, reference (if required). The A/P PITCH no reference light will extinguish and the VSD will display C (altitude).

To select an altitude:

1. On the DEP altitude menu, type desired altitude (if different from the preselected value). Press EXIT if you only want to save it as a preselected value.
2. Engage the autopilot (autothrottle as desired). The DEP ENTR legend will appear on the altitude submenu.
3. Press ENTR. The A/P PITCH no reference light will come on steady (if an altitude mode was not already engaged).
4. Reference (if required). The A/P PITCH no reference light will extinguish and the VSD will display C (commanded altitude).

NOTE

If control stick steering is subsequently entered by moving the stick, the A/P PITCH light will come on steady. Re-referencing will engage altitude hold or select, depending on which mode was originally engaged.

To deselect the altitude mode, press OFF on the DEP altitude keypad.

STEERING MODES

Selection of navigation steering modes is accomplished on the DEP steering menu (see FO-3). The six navigation steering modes are mutually exclusive, but any navigation steering mode can be used as a lead-in mode for ILS. If ILS is selected, steering switches automatically to ILS at localizer capture. Pressing any one of these switches selects the associated navigation steering mode, while deselecting any other steering mode that may have been in effect. Selection and deselection of steering modes has no effect on sensor modes or the video tape recorder.

The six navigation steering modes available are:

Destination steering	DEST
Course Line steering	CRS LINE
Course Select steering	CRS SEL
Manual Heading steering	MAN HDG
TACAN steering	TCN
Instrument Landing System steering	ILS

On initial powering up of the system, no steering mode is active.

Primary computations for the great circle navigation steering modes (destination, course line, course select), for the rhumb line mode (manual), and for TACAN and ILS, are provided by the N-WSC computer.

In all modes except manual heading steering and manual attack, the INS determined wind drift is applied to the selected course to produce the drift corrected heading. The drift corrected heading caret is an open arrowhead which appears just below the heading scale on the HUD and VSD and outside the compass card on the HSD. In the MAN HDG mode, the heading caret indicates the heading selected by the pilot using the HDG select knob on the auxiliary navigation panel, and is not drift corrected. The caret is not present in the MAN attack mode.

If destination steering or course line steering is in effect, then automatic sequencing between destination points is an available mode of operation, and can be selected by setting the rotary switch on the CDU to NAV/AUTO. Automatic sequencing is not available in the other steering modes, regardless of rotary switch position. When automatic sequencing is available and selected, sequencing to the TO destination point with the next higher sequence number occurs automatically when the aircraft flies over, or sufficiently close to, the current destination. The aircraft is considered to be sufficiently close if it is no more than 3000 feet horizontally from the destination point, and distance is increasing. When sequencing occurs, the number of the next sequential destination replaces the number of the previous destination in the TO window of the CDU.

The pilot may use the track change function to select any destination point, except those with sequence numbers from 94 through 98, at any time in any steering mode, though it is not actually relevant to the manual heading, TACAN and ILS modes. Destination points with sequence numbers from 94 thru 98 are MARK points, and can be selected by use of the track change function as TO destination points in any steering mode except course line steering.

When manual sequencing is selected, sequencing to the next TO destination point occurs only when the pilot uses the track change function on the CDU or DEP to select a new TO destination point, and steering along the last computed ground track is provided until then.

After a weapon release, the system will autosequence to the next DP (in AUTO) or to the manually selected DP at ATF plus five seconds.

To enter a steering mode:

1. On the DEP main menu, press STR or the active steering mode legend. The steer submenu will appear.
2. Select a mode or change values as described in DEP this section.

DESTINATION STEERING MODE

The purpose of this mode is to provide bank angle steering indicators to the pilot, and, at the pilot's option, steering orders to the autopilot to direct the aircraft to achieve and maintain a great circle route from its current position to the current TO destination point. The current TO destination point is indicated by the number appearing in the TO window of the CDU, and is also shown on all displays. The steering indicators appear on the head-up display (HUD) and the vertical situation display (VSD), augmenting basic flight displays (see Figures 4-4 and 4-13).

If destination steering is in effect, the bank steering bar and the drift corrected heading caret symbols are added to the basic flight displays. The bank steering bar is a vertical line on the HUD and VSD. It is positioned to the right or left of the velocity vector or aircraft pitch reference symbol, to indicate the bank angle necessary to steer to the required course. The drift-corrected heading caret is a moving indicator that makes up part of the magnetic heading scale on both the HUD and VSD and appears on the outside of the HSD compass card. The caret indicates the magnetic heading that the aircraft must maintain in order to stay on the required course, considering wind.

The pilot steers a great circle route to the current destination point by using the flight controls to bank the aircraft right or left as indicated by the steering bars. This keeps the velocity vector of the HUD and the aircraft pitch reference symbol of the VSD and ADI on the bank steering bar. Alternatively, the pilot uses the autopilot to steer the aircraft along this course by coupling to the active steer mode. In this case, the autopilot control of the aircraft keeps the velocity vector and the aircraft pitch reference symbol at, or near, the steering bar. Roll commands to the autopilot and for bank steering bars on the displays do not exceed 50° bank angle. The TO window of the CDU displays the number of the destination point to which the aircraft is being directed. That number also appears in the lower left corner of all CMDI displays.

The commanded course consists of an initial turning maneuver, if necessary, followed by a shortest flight path to the current TO destination point. At the end of the turning maneuver, the aircraft is at the starting point (SP), and is on the proper course for starting a great circle route from there to destination. If the aircraft is on the correct heading at the start of the destination steering mode, its current position is used as SP and the initial turning maneuver is omitted. Steering commands, including wind corrections, are continuously computed along the great circle route between SP and the current TO destination point. The course deviation indicators on the HSD indicate lateral or linear deviation from this course line. If this linear deviation exceeds 0.10 nm, a new SP is calculated and steering is then relative to the course between the new SP and the destination. The course arrow and digital readout on the HSD shows the course between the SP and the destination. The HSI course arrow and readout do not show these values. (Since the electromechanical HSI is independent of the INS, the HSI displays only the values input by the pilot.)

Flight path geometries for the destination steering mode are presented in Figure 4-18. Aircraft A occupies the position shown when destination steering is entered. Since the distance from the aircraft latitude and longitude to the current destination, P(i–1), is less than the turning radius of the aircraft, it continues on course until it can make a direct turn to fly over the point. Then, because autosequencing is not in effect in this example, the aircraft continues on the great circle course it was on when it flew over the point. Aircraft B, occupying the position shown when destination steering mode is entered, is already on the great circle route from the previous destination, P(i–1), to the current destination, P(i). The initial turning maneuver is therefore omitted. The aircraft proceeds along this route and flies over the current destination. Then, because autosequencing is in effect, the next point, P(i + 1) becomes the current destination, and the aircraft turns to the new required course. As the figure shows, this results in a course somewhat longer than the great circle route, since the turn radius cannot be zero. If the commanded course is followed, the aircraft flies over the next destination. If the pilot deviates more than 0.10 nm from the commanded course for any reason and then starts following the roll steering commands, either manually or by using the autopilot, the aircraft behaves as previously described. The aircraft turns toward the destination point, and then flies a great circle course from the starting point to the destination point. Aircraft C in Figure 4-18 shows this case. If the deviation is less than 0.10 nm, the aircraft is steered to intercept the commanded course at 90°. Aircraft D represents the general case in which the aircraft must turn to a new course when destination steering is entered, and at that time, the aircraft is far enough from the destination point that it turns toward the destination point.

If the pilot uses the track change function to change the current TO destination point as indicated in the CDU TO window and then enters destination steering, or performs the same two actions in the opposite order, the steering commands will be to the new TO destination point. This is not necessarily the destination numbered one higher than the last one passed. Sequencing continues thereafter from the destination number in the TO window. In destination steering, both automatic sequencing and manual sequencing between TO destination points are available modes of operation.

NOTE

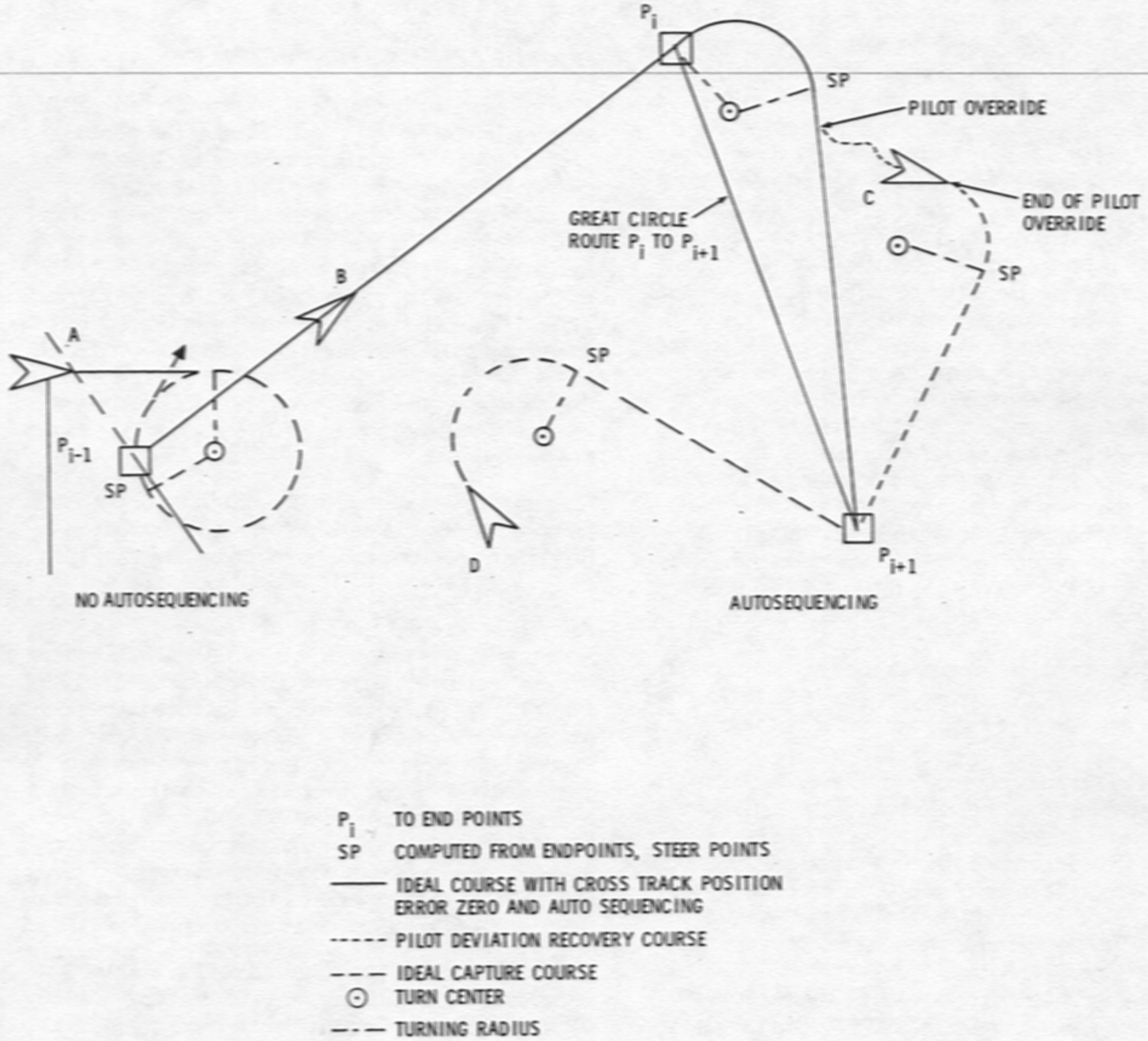
> In destination steering or in HNAV or VNAV on a destination steering leg, when a track change is made, or when destination steering is selected, steering will not be to the TO destination point unless the aircraft is greater than two turn radii from the DP, or the geometry is favorable (aircraft heading generally toward the DP). There is no indication to the pilot, other than the steering information, that this has occurred. Manually turning the aircraft toward the DP will not change this logic. However, deselecting/reselecting the steer mode, after turning toward the DP, should reset the logic, and proper destination steering commands to the DP will be available.

COURSE LINE STEERING MODE

The purpose of this mode is to provide bank angle steering indicators to the pilot and, at the pilot's option, steering orders to the autopilot, to direct the aircraft first to intercept the great circle course to the current TO destination point from the one preceding it in the preflight data, and then to maintain that course. The current TO destination point is indicated by the number appearing in the TO window of the CDU, and it is also shown on all displays.

The course arrow and digital course readout on the HSD show the course to be maintained, while the course deviation indicator shows the lateral cross track deviation from this course. The course arrow and readout on the electromechanical HSI show the proper course only if the pilot has set them with the course knob on the HSI or the auxiliary navigation panel.

DESTINATION STEERING FLIGHT GEOMETRY


P_i
SP
PILOT OVERRIDE
C
END OF PILOT OVERRIDE
GREAT CIRCLE ROUTE P_i TO P_i+1
SP
B
A
SP
P_i-1
SP
D
P_i+1
NO AUTOSEQUENCING
AUTOSEQUENCING
P_i TO END POINTS
SP COMPUTED FROM ENDPOINTS, STEER POINTS
—— IDEAL COURSE WITH CROSS TRACK POSITION ERROR ZERO AND AUTO SEQUENCING
----- PILOT DEVIATION RECOVERY COURSE
— — — IDEAL CAPTURE COURSE
⊙ TURN CENTER
— · — TURNING RADIUS

A213-111(a)

FIGURE 4-18

Manual steering, autopilot coupling, and displays are the same as for the destination steering mode. The commanded course consists of an initial turning maneuver and an approach to the great circle course at 90° angle to it, and another turning maneuver to intercept the required course smoothly, followed by the flight path along the great circle course to the current TO destination point. If the aircraft is sufficiently close to the required course line at the start of the course line steering mode, the approach at 90° is omitted. Steering commands including wind corrections are continuously computed through the required maneuvers. Flight path geometries for the course line steering mode are presented in Figure 4-19. Aircraft A occupies the position shown when course line steering is entered. It then proceeds along the dashed course if the current destination is P(i) or along the dotted course if the current destination is P(i+ 1). In both of these cases, the aircraft is initially far enough away from the required course that the 90° approach to course is necessary. Aircraft B, occupying the position shown when course line steering mode is entered, is close enough to the required course that the 90° approach is omitted. The aircraft turns first right or left,, as indicated, to follow the shorter of the two courses indicated by the dotted lines. Aircraft C occupies the position shown when course line steering is entered. It then proceeds along the dashed course if the current destination is P(i + 1). When it reaches the great circle extension of the course from P(i) to P(i + 1), it turns in the direction of this course, not toward P(i + 1). These three cases demonstrate that the aircraft may achieve the required course before passing over either of the points that determine the course, or between these two points, or without passing over either of them.

Aircraft D represents the case where the aircraft is heading away from the selected course line steering course, and the distance from the course is equal to or less than 1.05 times the turn radius. If the initial heading and the selected course difference is greater than 180°, the aircraft turns 270° to the right and then 90° to the left to assume the selected course. If the initial heading is equal to or less than 180° different from the selected course, the aircraft turns 180° to the left, and then makes a final 90° right turn at the turn radius to assume the selected course.

Aircraft E is at a distance greater than 1.05 times the turn radius from the selected course, and the initial heading is away from point Pi. The aircraft turns to the right if the initial heading and the selected course differ by 90° or more, approaches the selected course on a heading 90° to the course, then makes a final 90° right turn at the turn radius to assume the selected course. If the initial heading and the selected course differ by less than 90°, the aircraft turns left, approaches the selected course on a heading 90° to the course, then makes a final 90° right turn at the turn radius to assume the selected course.

After the aircraft passes over a destination point in this mode, ground track steering along a great circle extension of the last computed ground track is provided if manual sequencing is in effect, and steering to the course line to the new destination point from the one just overflown is provided if automatic sequencing is in effect.

COURSE SELECT STEERING MODE

The purpose of this mode is to provide bank angle steering indicators to the pilot, and at the pilot's option, steering orders to the autopilot, to direct the aircraft to achieve and maintain the great circle route to the current TO destination point with a specified approach course. The pilot dials the desired approach course using the course set knob below the left MDI on the auxiliary navigation panel or the DEP keypad. The current TO destination point is indicated by the number appearing in the TO window of the CDU, and is also shown on all displays. The steering indicators appear on the head-up display (HUD) and the vertical situation display (VSD) augmenting basic flight displays.

Manual steering, autopilot coupling, and displays are the same as for the destination steering mode. The flight path geometry for this mode is shown in Figure 4-20.

Aircraft A occupies the position shown when course select steering is entered. It is sufficiently off course to the selected destination P(i) that it turns to assume a heading 90° to the required course, then turns again to assume the course as it is approached. Aircraft B is sufficiently close to the required course that the 90° approach is omitted. Aircraft C is on the required course, so turns are omitted. The position and heading of Aircraft D when course select steering is commanded require a right turn followed by a left turn, with the turn centers straddling the required course, to achieve the required course to destination P(i).

Aircraft E, south of the required course when course select steering is entered, turns to assume a heading 90° to the required course, then turns again to assume the course as it is approached. Aircraft F is sufficiently close, both in position and heading, that it assumes the required course in one turn after reaching the turn center. Aircraft G is sufficiently off course and out of position relative to destination P(i) that a 180° turn, followed by a 90° approach to the course and a 90° turn is required to achieve the selected course. However, Aircraft G is now past and heading away from the destination. In this case, the destination pointer on the HSD reverses to indicate the reciprocal heading to destination P(i), and a final 180° turn is required.

COURSE LINE STEERING FLIGHT GEOMETRY

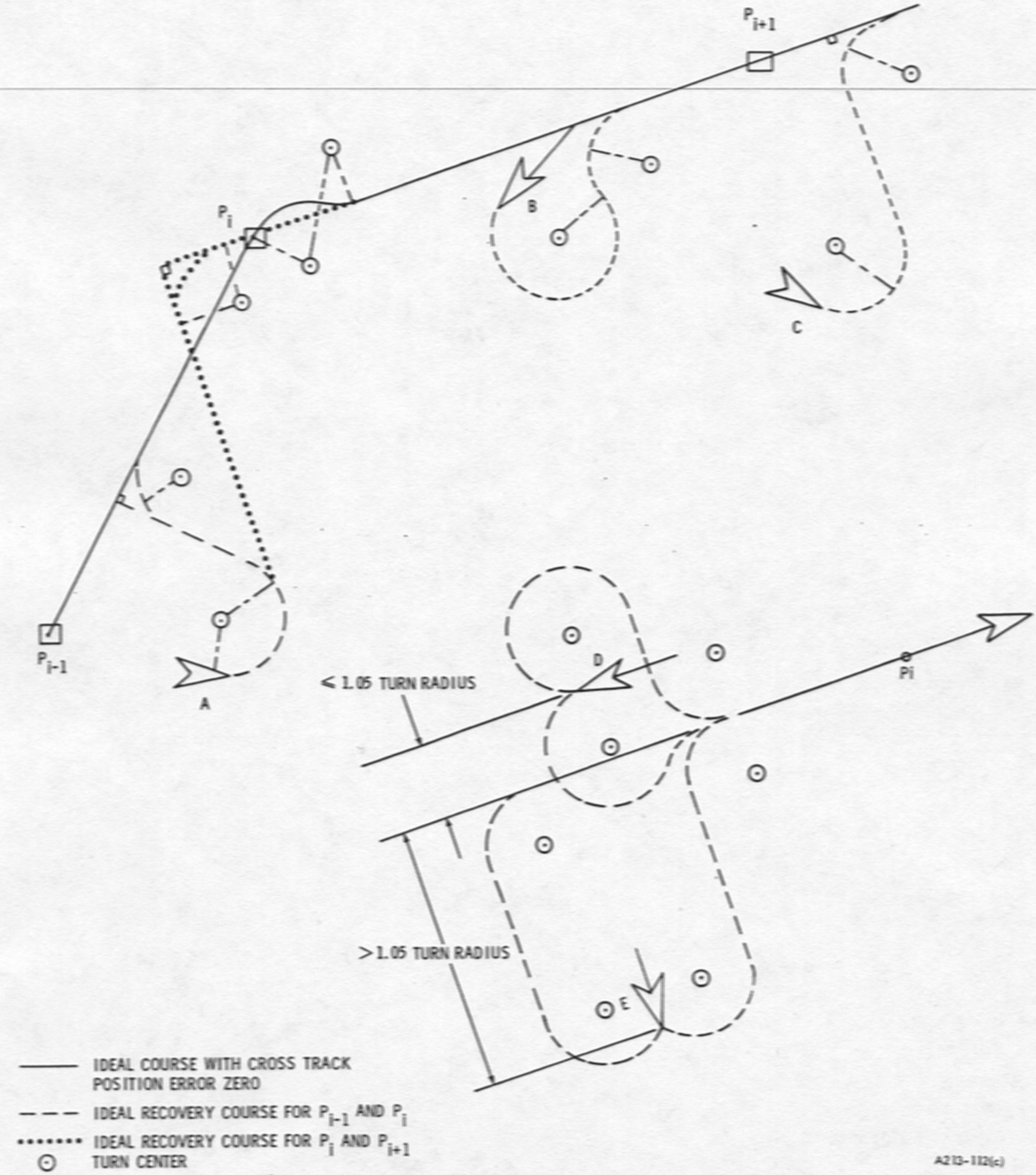

P$_{i+1}$
P$_i$
B
C
P$_{i-1}$
A
TO DP
D
Pi
≤ 1.05 TURN RADIUS
> 1.05 TURN RADIUS
E
IDEAL COURSE WITH CROSS TRACK POSITION ERROR ZERO
IDEAL RECOVERY COURSE FOR P$_{i-1}$ AND P$_i$
IDEAL RECOVERY COURSE FOR P$_i$ AND P$_{i+1}$
TURN CENTER
A213-112(c)

FIGURE 4-19

COURSE SELECT STEERING FLIGHT GEOMETRY

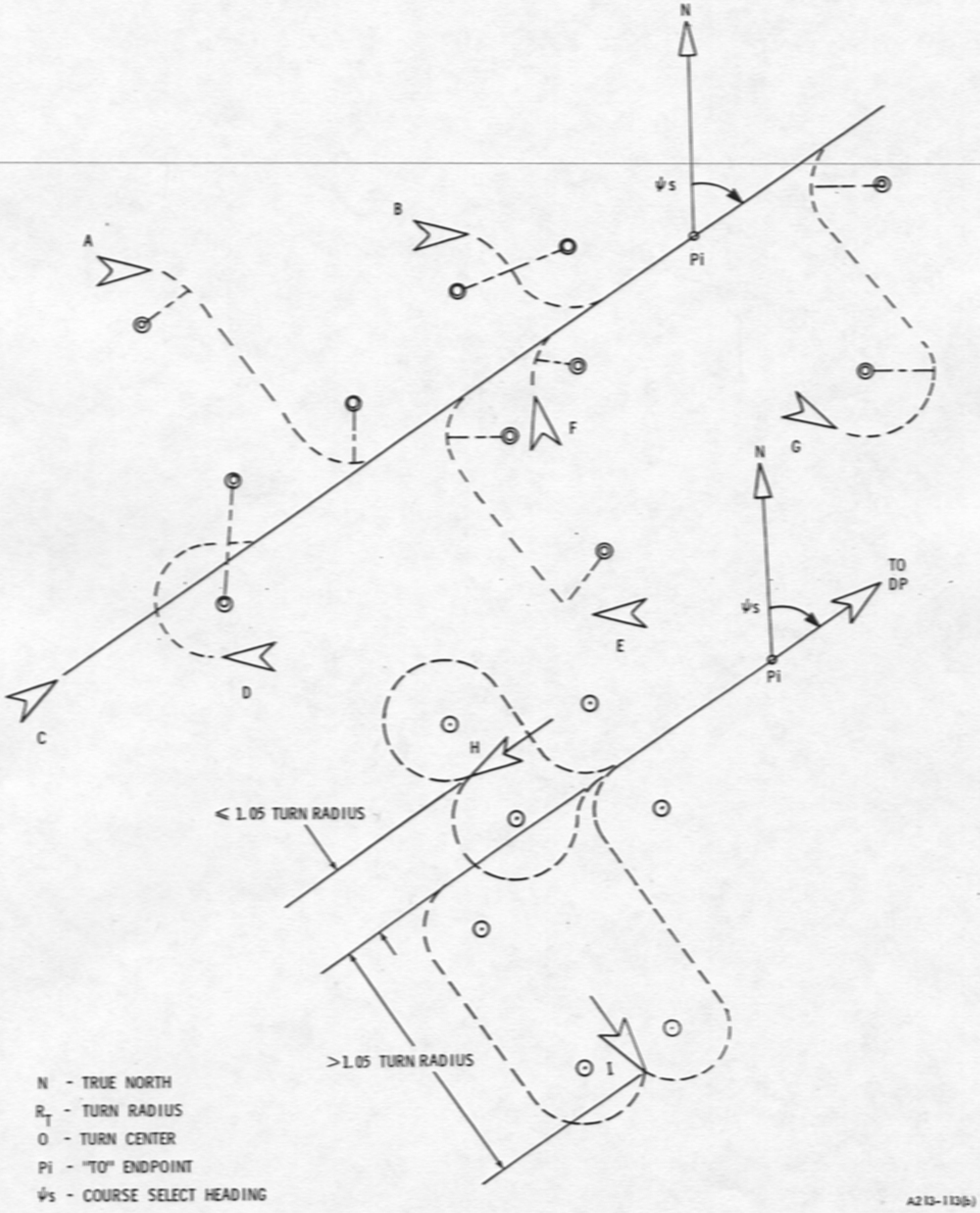


FIGURE 4-20

The conditions under which Aircraft H and I approach and assume the course select steering course are the same as previously described for the course line steering flight geometry.

Whenever the selected TO destination point lies within the circle traversed by the aircraft at a 50° bank angle, then the aircraft first turns right or left to follow the shorter route to achieve the selected course. Steering away from the current TO destination point results if the aircraft is past the destination. When destination data is not available, or the destination is overflown and the pilot has not yet sequenced, constant ground track steering on a great circle extension of the last computed ground track is provided. The navigation hold submode of the autopilot may be used in course select steering mode. In course select steering, automatic sequencing through destination points does not occur, regardless of the setting of the navigation mode rotary switch.

MANUAL HEADING STEERING MODE

The purpose of this mode is to provide bank angle steering commands to the pilot, and, at the pilot's option, bank commands to the autopilot to keep the aircraft on the heading selected by the pilot. These indicators appear on the head–up display (HUD), and the vertical situation display (VSD), augmenting basic flight displays. The heading set knob below the left CMDI on the auxiliary navigation panel or the DEP keypad is used to select the heading.

If manual heading steering is in effect, the bank steering bar and the drift corrected heading caret symbols are added to the basic flight displays (see Figures 4–13 and 4–14). The bank steering bar, (a vertical line) on the HUD and VSD, is positioned to the right or left of the velocity vector or aircraft pitch reference symbol. It indicates which way the pilot should turn to achieve the selected heading. If the present heading and the selected heading differ by less than 30° the steering bar indicates a bank angle less than 30°. The drift corrected heading caret is a moving indicator that makes up part of the heading scale on both the HUD and VSD. The caret is the same one used for drift corrected heading in several of the other modes, but in this mode is indicates only the heading that the pilot has selected. Wind drift compensation is not provided. The course deviation indicator on the HSD is centered. The heading marker on the electromechanical HSI does not indicate the selected heading unless the pilot sets it with the HSI heading knob.

Manual steering, autopilot coupling, and displays are the same as for the destination steering mode.

If TACAN data are valid, the TACAN course arrow and CDI will be displayed.

TACAN STEERING MODE

This mode provides deviation data and bank steering commands to the pilot to support manual or automatic intercept and tracking of a selected TACAN radial (see Figure 4–14). Bearing and DME data to the TACAN station are available on the HSD and HSI whenever such data are valid, regardless of the selected steering mode. Similarly, TACAN DME is always available on the HUD and VSD when it is valid regardless of steering mode. A TACAN radial can be preselected at any time on the DEP keypad or the CRS knob on the auxiliary navigation panel.

The course deviation indicators on the HSD and HSI display angular deviation between the aircraft's position and the radial. The scale dots represent ± 5° and ± 10° deviation. The drift corrected heading (DCH) caret below the heading scales of the HUD and VSD, and on the outside of the compass card on the HSD, indicates the magnetic heading required to compensate for wind in order to maintain the reference radial. The DCH appears, regardless of the presence of a valid TACAN signal, since the DCH position is calculated by the N–WSC based on wind and selected radial.

When TCN is selected on the DEP steer submenu, and TACAN data are valid, bank steering bars are displayed on the HUD, VSD, and ADI. The steering mechanization is identical to the course select steering mode with respect to the approach and intercept of the desired radial. The only difference is that the steering commands are based on TACAN data rather than inertial data.

Capture maneuvering is automatically programmed as a function of course error and deviation. A high crosstrack error rate resulting from high groundspeed, large intercept angle, short distance from the TACAN station, or any combination of these factors, may cause initiation of capture maneuvering before the course deviation indicators leave their fully deflected positions. This minimizes the possibility of an initial overshoot of the radial. Approach to and intercept of the selected radial is without regard to the TACAN station location. The course is established in the most expeditious manner, whether or not the result is to head to or away from the TACAN station.

The mode may be used with autopilot engaged. Bank angles will not exceed 30° in TACAN mode.

If TACAN data becomes invalid, all TACAN peculiar displays are removed after three seconds, including the bank steering bars. If the autopilot is engaged and coupled, the submode will drop out and the A/P ROLL no reference light will flash.

When the flight director senses that the aircraft is in the cone of confusion surrounding the selected TA-

CAN station, bank angle commands are replaced by commands to maintain the aircraft's heading. This overstation condition is terminated by capture of the outbound radial.

The bank steering bar on the ADI is driven the same as those on the HUD and VSD with a mechanical flag providing an invalidity indication instead of symbol blanking. The HSI and HSD course deviation indicators function exactly the same. However, the pilot must set the proper course using the HSI course knob or DEP keypad in order to obtain a proper presentation.

ILS STEERING MODE

The ILS steering mode is selected by pressing ILS on the DEP main menu or the steering menu. ILS PRE will be displayed initially.

While the system is in the ILS PRE mode with no other steering lead-in mode selected, and the localizer signal is valid (raw data displayed), a heading capture mode is in effect. If the pilot enters roll control stick steering (by control stick displacement), the roll no-reference light will illuminate. If the stick reference designate switch is subsequently depressed, the light will extinguish and the aircraft will roll out at and maintain the heading at which the reference occurred.

NOTE

> If a lead-in steering mode is coupled in ILS PRE mode, and the steering mode is deselected, the roll no-reference light will not flash, but remain extinguished. If control stick steering is subsequently entered, the light will come on steady. If the stick reference designate switch is then depressed, the autopilot will roll to and maintain the bank angle that existed at the time the steering mode was deselected.

This mode provides bank and pitch steering commands to the pilot to support manual intercept and tracking of the ILS localizer and glideslope. It also provides bank commands to the autopilot to support automatic localizer steering. Bank and pitch steering bars appear on the HUD and VSD at capture (see Figure 4-14). Localizer course and glideslope deviation are displayed on the VSD. Angular course deviation is also shown on the HSD. Flight director commands, localizer course, and glideslope deviation are also presented on the ADI and HSI. The pilot must set the proper localizer course in order to obtain a proper presentation. DME is displayed on the HUD, VSD, and HSD if valid.

When ILS is selected on the DEP panel, the preselect box on the HSD displays the currently selected ILS localizer course. The localizer course is displayed as a three-digit readout below the box.

When the ILS steering mode is selected on the DEP panel, and a valid ILS localizer signal is being received by the aircraft the DEP legend changes to ILS LOC, the active steering mode changes to ILS, and localizer course deviation indicators and drift corrected heading carets are added to the HSD and VSD. Course deviation information is also activated on the HSI. When a valid ILS glideslope signal is being received, the glideslope deviation indicator is added to the VSD and activated on the ADI.

When localizer capture commences, a bank steering bar appears on the HUD, VSD and ADI. Capture maneuvering is automatically programmed as a function of initial course error, localizer deviation, and deviation rate. Capture is not initiated until deviation is 3.4 dots or less. To minimize aircraft overshoot when performing close-in 90° intercepts, the maximum bank command available is ±35°. For optimum capture of the localizer, the intercept angle should not exceed 90°.

NOTE

> Selection of ILS steering late in the approach may result in a poor capture, since capture is inhibited for six seconds following ILS steering mode selection to allow the computations to stabilize.

When ILS localizer data are valid but not active (deviation greater than 3.4 dots), the system captures the heading at which the autopilot is coupled.

Keeping the steering bar centered causes the aircraft to intercept and track the localizer. When commanded bank angle is 5° or less, the roll rate command limit is reduced from ±10°/sec to ±5°/sec and a 30 second timer is started. When this time expires, if commanded bank angle is still less than 5°, the bank angle command limit is reduced from ±45° to ±10°.

When localizer capture has commenced, and glideslope capture data are valid, glideslope capture is enabled. When glideslope capture commences, a pitch steering bar appears on the HUD, VSD, and ADI. If a false capture occurs, ILS steering returns the aircraft to the heading existing at the time of capture, and the ILS steering mode is maintained. The pitch command is limited to + 12.5° and -2.5°. Glideslope capture maneuvering is programmed as a function of glideslope deviation and allows capture from above and below the glideslope.

NOTE

- On the HUD, the steering bars are referenced to the velocity vector. On the ADI, the bars are referenced to the aircraft waterline symbol. On the VSD, the bars are referenced to whichever is selected.
- The ADI bank and pitch steering bars are stowed when:

  The HSI switch is not in the BUS position.

  The autopilot is not referenced when in ILS heading mode.

  The ILS data are not valid.

The autopilot is compatible with the ILS steering mode. However, only bank steering commands are coupled. Automatic glideslope tracking is not provided.

To select ILS on the main menu, press ILS. The legend will change to ILS PRE, then to ILS LOC when localizer capture occurs.

The ILS may be deselected on the main menu by pressing ILS PRE (if in ILS PRE) or on the steer menu by pressing the ILS button (if localizer has been captured).

SPEED MODES

The speed menu may be entered from the main menu by pressing SPD (if autothrottle is not engaged) or CAS, GS, Mach, or AOA (whichever is engaged) (see Figure FO-3). The default mode is CAS HOLD. Engaging the autothrottle engages CAS HOLD, as does deselecting any other mode. Autothrottle may be used with or without autopilot.

To enter CAS HOLD

Autothrottle not engaged:

1. Engage autothrottle.

Autothrottle engaged:

On the speed menu:

1. Deselect (press switch above) the active mode or press CAS HOLD.

In both cases the main menu SPD legend, changes to CAS and VSD displays C (value) CAS.

To select a speed:

1. Engage autothrottle.
2. On speed menu, if the preselect value of the mode is desired, press the switch over the mode. The DEP returns to the main menu. If a new value is desired, proceed as described in DEP, this section.

NOTE

Airspeed may be preselected in the active or inactive mode, whether or not the autothrottle is engaged.

TIME OVER POINT (TOP)

TOP is a speed mode designed to compute and control the ETA direct (destination steering) to any destination point. The TOP DEP menu is selected from the speed menu by pressing TOP (Figure FO-3). When the TOP menu is selected from the main menu, it displays (from left to right) the destination number, the current ETA (direct), the ETA window (computed for 250 KCAS to max speed/Mach) and current ground speed. To enter the TOP mode, press ENTR (if TOP destination is the current steer-to-destination) or TRK C (if not).

To change the destination number, press destination select (DSTS). The DEST SEL keypad will appear. Type in the desired destination numbers and press ENTR. The TOP menu is displayed with the new destination number.

To enter a desired ETA, press ETA on the TOP menu, enter the desired ETA (hour, minutes, seconds) on the keypad. ENTR inputs the ETA and returns to the TOP menu without inputting the new ETA.

After pressing ENTR on the keypad, the TOP menu displays the new ETA and the computed ground speed to achieve that ETA When ENTR/TRKC is pressed, the new ETA is commanded, the DEP returns to the main menu, the VSD displays the commanded ground speed, and the autothrottle (if engaged) will move to achieve the commanded ground speed. If the TOP menu is again selected, it will once again display the current ground speed and the real time ETA for that ground speed. The ETA keypad status line will also display the current (not desired) ETA. Once the aircraft is at the desired ground speed, the displayed ETA will be the desired.

NOTE

If the keypad is again selected and ENTR is pressed before the aircraft is at the desired ground speed, the current ETA (for the current ground speed) will be entered as the desired ETA. Use EXIT to return to the TOP menu without changing commanded ETA.

If the autothrottle is not engaged the top left window of the TOP menu will display TOP OFF if the TOP mode is active. Pressing TOP OFF deselects the mode. If the autothrottle is engaged, TOP OFF does not appear. In this case, the TOP mode is deselected by selecting another speed mode or disengaging the autopilot.

Whenever the desired ETA is more than 30 seconds outside the TOP window, the VSD TOP display will be yellow.

PRE-PLANNED MODES

HNAV

The HNAV mode navigates the aircraft along a preplanned horizontal flight plan. The HNAV mode is engaged by pressing HNAV on the DEP and is also engaged when VNAV mode is selected even though the HNAV legend is not lighted.

VNAV

The VNAV mode contains both the altitude and navigation elements of the planned flight profile. When VNAV is selected on the DEP the HNAV legend light will go off (if previously engaged) but the H will remain on the horizontal command line of the VSD.

SNAV

The SNAV mode provides the preplanned speed for each leg of the flight. SNAV is engaged automatically if a navigation (HNAV or VNAV) mode is active, but can be deselected by pressing the button. Speed mode commands are displayed on the VSD whether or not the autothrottle is engaged.

TIME OVER TARGET (TOT)

The TOT mode is a planned speed mode which calculates the speed schedule required to arrive at a desired time over a destination point which has been set to be a primary point (see TOT Flag, this section). The mode requires at least HNAV and SNAV modes active, and may be coupled to the autopilot/autothrottle or flown manually by reference to the airspeed and steering commands on the VSD and HUD. The general philosophy of the mode is to attempt to get back onto the preplanned speed/ETA schedule as soon as practical, and then maintain that schedule. The following considerations apply:

1. Speed will be limited to limit airspeed/Mach number maximum and 250 KCAS minimum.
2. Because of terrain clearance considerations, speeds during climbs and descents with VNAV and TOT selected may not be at the TOT-adjusted speeds. With normal climbs or descents specified, the TOT-adjusted speeds will normally be used.
3. The speed for any given leg may be forced to the preplanned value by means of the Disable flag (See TOT Flag, this section). This can be set only through the DEP TOT FLAG menu (not by MDPS).
4. Any planned holding time at destination points will be taken into account when calculating ETAs and required speeds. However, the TOT mode will not cause the holding to be accomplished. It is the pilot's responsibility to leave the holding pattern at the proper time (and reengage TOT) to allow the system to return to the TOT-adjusted speed schedule.
5. TOT will be displayed on the main menu if the SNAV mode is active and there is at least one primary point in the flight plan.
6. An attack mode may be selected while in TOT. After the attack, deselecting the attack mode will return the system to TOT (if there is another primary point).

To select the TOT menu, press TOT on the main menu (see Figure FO-3). The submenu shows the primary point number, the TOT (ETA) for that point (minutes, hours, seconds), and the achievable ETA window (minutes, hours).

To enter the TOT mode, press ENTR.

To enter a new TOT, use as a normal keypad. The upper right panel will change to SET. Press SET to change the TOT, or press EXIT to return to the main menu without changing TOT.

Press NEXT to advance to the next primary point. If there is only one primary point, NEXT will not be displayed.

The VSD will display T (or TC if coupled), the TOT-adjusted speed command, and the speed type. The speed type will be the same as that on the flight plan (CAS, GS, or M). If the specified TOT is more than 30 seconds outside the achievable window, the T will be yellow.

NOTE

On the DEP TOT menu, the ETA is displayed to the nearest second, but the achievable window is displayed to the nearest minute. therefore, it is possible to display an ETA which is at the minimum or maximum window times, but out of the window by as much as 30 seconds (or vice versa). The C on the VSD will be yellow only if the ETA is at least 30 seconds out of the window.

To deselect TOT press OFF on the TOT menu or disengage SNAV.

EDIT DISPLAYS (DEP)

The DEP EDIT submenus or keypads (see Figure FO-3) are the only means of data entry, except for partial capability on the CDU. Latitude, longitude, OAP latitude and longitude, OAP elevation, and MEA data can be edited from the CDU as well as the DEP. Entries from the DEP and CDU are independent of each other.

To bring up these keypads, press EDIT on the DEP main menu. The DEP will default to the current destination point when the EDIT or MAP DP function is selected. The resulting menu will be for the destination point currently centered on the CMDI edit page, and the data will be that which is currently at the cursor of the CMDI edit page. The current edit destination is shown at the far right of the status line on all menus. The arrows at the left end of the menu are used to sequence through the data for the current edit destination point. The current edit destination point itself may be changed either by the DEST arrow button on the CMDI edit page, or through the MAP DP function of the DEP. On all menus, the current data will be displayed on the status line.

The following is a discussion of the DEP edit menus (refer to Figure FO—3).

a. Latitude (LAT):

North (N)or south (S) must be typed first, followed by the latitude in degrees, minutes, and hundredths of minutes. All digits, except leading zeros, must be entered.

Longitude (LON):

Same as latitude except east (E)or west (W) must be typed first.

b. Speed Cruise (SPD CRZ):

Select CAS, GS, or MACH; the preselect values will be displayed on the status line and may be changed on the keypad.

c. Climb/Descent Speed (SPD C/D):

Climbs and descents may be programmed in various ways:

1. Normal (NORM) – Climbs at speed for maximum rate-of-climb or cruise speed, whichever is lesser.

   – Descends at cruise speed
2. Descent (DESC) – Descends at 250 KCAS with throttle idle.
3. Throttles at maximum or idle with speed specified – Enter desired speed type and value.
4. Speed specified, rate-of-climb/descent specified – Enter desired speed type and value.

d. Vertical Velocity (V,V)

Enter desired rate of climb/descent in feet per minute (F/M). Enter zero for max or idle throttle.

e. Time Over Target (TOT FLAG)

Press P to alternately designate/undesignate the point as a primary point. Use the keypad as shown to change ETA. The TOT window is not shown as it is on the DEP TOT submenu. Press D to alternately disable/enable TOT speed adjustments for that leg (with D on the status line, the system will always use the preplanned speed for that leg).

f. Fuel Remaining (FUEL REM)

Enter the planned fuel remaining at the destination point in pounds.

NOTE

The system will not calculate this number if speed, coordinates, etc. are changed. The pilot must calculate and enter the fuel remaining.

g. Destination Type (D TYPE)

Press the button for the desired destination type. Choosing a destination from the top row will display the holding time (HLD) keypad. Enter desired holding time in minutes and seconds. The destination type is for display only and does not affect any other commands.

h. Elevation (ELEV)

Enter destination elevation (MSL) to the nearest foot. The + /– key toggles between negative and positive for elevation entries. To enter zero elevation, press + /–, 0, and ENTR.

i. Altitude (ALT)

Enter cruise altitude to the nearest hundred feet MSL. CARY sets or removes a carry over altitude bit. This is used when continuous climb is desired through one or more destination points without intermediate level-offs. If the final altitude is entered and CARY set for each intermediate point, the climb will be continuous to the final altitude.

j. Minimum Enroute Altitude (MEA)

   Enter MEA to the nearest hundred feet MSL.

k. Bank Angle (BANK ANG)

   Press either 30 or 50 degrees to command bank angle at the destination point.

l. Wind Direction (DIR WIND)

   Wind information is used to support TOT calculation. Enter wind direction in degrees of true heading (from).

m. Wind Speed (WIND SPD)

   Enter wind speed in knots.

n. Steering type (STR TYPE)

   Press the button to select the desired steering mode. Pressing OFLY will cause the aircraft to overfly the destination point. If OFLY is not selected, turn-short is commanded.

SPREADSHEETING

Changes to the flight plan parameters will spreadsheet to other legs according to the following rules.

1. When the ETA is changed with the TOT edit keypad or the TOT main menu function for any valid destination point, the ETAs will automatically change for all other valid destination points, including previous points.
2. Edits to holding time affect the leg following the edited point.
3. Edits to climb/descent, speed, altitude rate, wind direction, wind speed, and cruise speed affect the leg approaching the edited point.
4. Edits to altitude commands, steering mode, and overfly status affect the approaching and following legs.
5. Edits to the bank angle command affect the approaching leg but will also affect the leg prior to that if turn short steering is in effect for that leg.
6. Edits to latitude and/or longitude affect at least the approaching leg and the following two legs. If turn-short is commanded for the leg prior to the approaching leg, then that leg is affected also.

The resulting time increments for 2 through 6 above, will be propagated as follows:

1. If there are no primary points subsequent to the affected leg(s), then the ETAs for all subsequent points will be incremented.
2. If there is a primary point subsequent to but not behind the affected leg(s), all ETAs prior to the affected legs will be incremented.
3. If there are primary points prior to and subsequent to the affected leg(s), ETAs between the prior primary point and the affected legs will be incremented.

MISCELLANEOUS DEP FUNCTIONS

MAP DESTINATION POINT (MAP DP)

The MAP DP function is used to control the center point of the manual map and to select the middle destination point on the CMDI EDIT display. The MAP DP keypad is selected from the DEP main menu (see Figure FO-3). When a new destination point is entered in MAP DP, both the manual map and the EDIT display will center on this point.

TRACK SELECT (TRK SEL)

Pressing TRK SEL on the DEP main menu selects the track select keypad and allows incrementing and decrementing the steer-to destination number, shown on the status line, with up and down arrows. The new destination number can also be changed by using the numeric keypad. This method removes the increment/decrement arrows and the upper left button changes to CLR when the first digit is pressed. The lower left button goes blank. The TRK C button will immediately change the destination number if the candidate destination number is valid. If not valid, the number will blink and CLR will appear in the upper left button if not already there.

The TRK SEL destination number may be preselected by making a change and then using the EXIT button. If an invalid destination number was preselected, it would not be obvious until the track select keypad was brought up again and the TRK C button pressed.

A track change may also be performed on the CDU.

TERRAIN MONITOR/SEARCH (TM/SRCH)

The TM/SRCH button on the DEP is a cyclic switch (OFF, TM, SRCH) for the terrain monitor and search IRADS modes. Refer to F-117A Utility Nonnuclear Weapons Delivery Manual (TO 1F-117A-34-1).

RECORD (RCRD)

The RCRD button on the DEP turns the video recorder off and on. The RCRD legend will change to backlit STBY during the seven second tape thread time if the VTR is manually turned on. When threading is complete and recording starts the legend will change to backlit RCRD. If recording does not start, STBY will remain until the RCRD function is manually deselected. The STBY legend will not illuminate if the VTR is turned on by target acquisition.

KEYPAD ENTRY LIMITS

Data entries within the limits shown in Figure FO-3 will be accepted and the selected mode will engage at that value when entered. Attempted data entries (ENTR pressed) outside these limits will cause the status line to flash until the CLR button is pressed to remove the error. If EXIT is pressed, the DEP will return to the main menu and the previous preselected value will be retained.

AUXILIARY NAVIGATION PANEL

The AUX NAV panel knobs may be used to set headings and courses. If a value is changed on this panel (referring to the HSD course preselect box), the same value will appear on the DEP steer menu or corresponding keypad. Conversely, if a value is changed on the DEP, the change will be displayed on the HSD course preselect box.

NOTE

If the HSD is not displayed, turning the heading or course knobs will change the values of the last parameter in the HSD window. If the corresponding DEP keypad is displayed, values will be displayed there.

TURN SHORT/OVERFLY STEERING

In turn-short steering, a turn is commanded prior to reaching a destination point so that the aircraft rolls out on the course to the subsequent destination point. In overfly steering, the aircraft is commanded to fly over the current destination point, then turn to intercept the course to the next destination point. In unplanned steering, course line steering will always be turn-short, and destination and course select steering will be overfly. In pre-planned modes, the aircraft will either turn short of or overfly the destination point as commanded by the MDPS flight plan.

SENSOR UPDATES

Sensor updates should be performed sufficiently in advance of autosequence to allow time for the biases to be utilized. To avoid introducing system altitude error, IRADS and HUD sensor updates should be performed at, or close to, the delivery altitude.

NOTE

- If a sensor update is attempted near the 90° look-down angle, and the selected TO destination point increments (due to CDU and DEP switch selections) during the update process, the update may be grossly in error or may fail. All switch actions required to accomplish a sensor update should be completed before the aircraft overflys the current TO destination point and before autosequence occurs.
- When the sensor update function is activated on the CMDI, by boxing the SNSR legend, the CLR function is not available on the TP and HSD displays.

IRADS SENSOR UPDATE

1. FLIR/DLIR rotary mode switch – IR/LSR (or IR)

   An IRADS update may be performed with the FLIR/DLIR in the IR mode. In this case the range to the designated position will be computed using inertial altitude and IRADS angles.
2. LASER rotary mode switch – AUTO
3. Designator select switch – IRADS (center)

   To obtain maximum accuracy, IRADS must be in AVT or MPT submode and pointing at the update position before the HSD or MAP SNSR switch is pressed.
4. Offset select switch – As required

   Select OAP 1 (up), OAP 2 (down) or DEST (center) as appropriate.

NOTE

- Indication of invalid OAP data is an X in place of the normal A next to the destination number.

5. DEP TM/SRCH switchlight – Deselect
6. DEP ATK – Deselect
7. CDU TO window – Desired destination point
8. X-Y slew/designate switch – Slew as required, press, release

   Slew the IRADS LOS cursor to the actual destination or OAP position using the X-Y slew/designate switch on the right throttle, then press and release the switch.
9. HSD or MAP SNSR switch – Press

   Bearing, range, and altitude difference are displayed in the upper left corner of the HSD and MAP replacing TAS and GS.

To accept the bearing, range, and altitude bias:

10. HSD or MAP ENTR switch - Press

    The bias is removed from the CMDI and stored in destination 99. TAS and GS are redisplayed.

To reject the bearing, range, and altitude bias:

11. HSD or MAP CLR switch - Press

    The bias is removed from the CMDI and TAS and GS are redisplayed.

HUD SENSOR UPDATE

1. Designator select switch - HUD (forward

   A HUD sensor update may be performed if IRADS is not providing valid LOS data.

   NOTE

   The HUD cursor must lie below the horizon.

2. Offset select switch - As required

   Select OAP 1 (up), OAP 2 (down) or DEST (center) as appropriate.

   NOTE

   Indication of invalid OAP data is an X in place of the normal A next to the destination number.

3. DEP ATK - Deselect
4. CDU TO window - Desired destination point
5. X-Y slew/designate switch - Slew as required, press, release

   Slew the HUD LOS cursor to the actual destination or OAP position using the X-Y slew/designate switch on the right throttle, then press and release the switch.

6. HSD or MAP SNSR switch - Press

   Bearing, range, and altitude difference are displayed in the upper left corner of the HSD and MAP replacing TAS and GS.

To accept the bearing, range, and altitude bias:

7. HSD or MAP ENTR switch - Press

   The bias is removed from the CMDI and stored in destination 99. TAS and GS are redisplayed.

To reject the bearing, range, and altitude bias:

8. HSD or MAP CLR switch - Press

   The bias is removed from the CMDI and TAS and GS are redisplayed.

VISUAL UPDATE

1. CDU TO window - Verify desired destination point

When directly over destination point:

2. CDU VIS UPDT switch - Press

   VIS UPDT, BRG RNG, and ENTR switchlights come on. The hearing and range bias from the INS position to the aircraft's present position (visual update) is displayed in the CDU upper and lower main display windows, respectively.

   NOTE

   Latitude and longitude bias is also displayed by pressing the LAT/LONG switchlight.

To accept the bearing and range bias:

3. ENTR switchlight - Press

   VIS UPDT, BRG RNG, and ENTR switchlights go off. INS position is updated and the bias is stored in destination 99. P-P (present position) switchlight comes on.

To reject the bearing and range bias:

4. CLR switchlight - Press

   VIS UPDT, BRG RNG, and ENTR switchlights go off. CDU upper and lower main displays go blank.

IRADS/MAP UPDATE

The INS may be updated by correlating an IRADS ground return with the corresponding point on the map display.

1. FLIR/DLIR rotary mode switch - IR/LSR (or IR)

If laser ranging is desired:

2. LASER rotary mode switch - AUTO
3. Control stick designator select switch - IRADS (center)
4. DEP TM/SRCH switchlight - Deselect
5. DEP ATK - Deselect
6. CDU TO window - Desired destination point
7. Throttle slew/designate switch - Slew as required, press, release

   Slew the IRADS LOS cursor to the selected return on the sensor display using the slew/designate switch on the right throttle, then press and release the switch.

8. Control stick designator select switch - MAP (left) position

   The throttle slew now controls the map cursor.

9. CMDI map display – Press UPDT
10. Throttle slew/designate switch – Slew as required, press, release

    Slew map cursor over the corresponding point on the map, then press and release the switch. Bearing, range, and altitude differences are displayed in the upper left corner of the HSD and MAP replacing TAS and GS.

To accept the bearing, range, and altitude bias:

11. HSD or MAP ENTR switch – Press

    Values are removed from CMDI and TAS and GS are redisplayed.

To reject the bearing, range, and altitude bias:

12. MAP display UPDT switch – Press, or throttle DSS switch – Center position

    Values are removed from CMDI and TAS and GS are redisplayed.

MARK (RECONNAISSANCE POINT IDENTIFICATION)

The IRADS or HUD may be used with the HSD or MAP MARK switch and the designate switch to store the coordinates and elevation of up to five points of interest. These points are assigned destination point numbers 94 through 98. The IRADS is normally used, if available, to provide the most accurate elevation data.

1. CMDI MARK switch – Press

   The MARK legend on the CMDI boxes, showing MARK function activated.
2. Control stick designates select switch – IRADS (center) or HUD (forward)
3. IRADS or HUD cursor – Slew to place over desired point
4. Throttle designate or undesignate switch – Press and release

   Selects AVT or MPT.

To exit the function without marking the point:

5. MARK or CLR switch – Press

   The box on the MARK legend disappears.

To mark the point:

6. CMDI ENTR switch – Press

   The coordinates and elevation of the marked point are entered, the CDU BIT/DEST window and displayed information change to the mark destination (94-98), and the box on the MARK legend disappears.

ALTITUDE CALIBRATION

An altitude calibration is performed to update the ins altitude in case of ADC failure to prevent INS accuracy degradation, and to improve baro bombing accuracy.

1. CDU ALT CAL switchlight – Press
   a. ALT CAL switchlight comes on
   b. Last valid baro reference altitude is displayed in the CDU upper main display
   c. Baro damped INS altitude is displayed in the CDU lower main display window.
2. ENTR switchlight – Press

   ENTR switchlight comes on.
3. Keyboard – Enter altitude (AGL) selected to overfly the selected destination point using the radar altimeter or laser ranging as a reference

   Keyed in altitude is displayed in the CDU upper main display.
4. Radar altimeter – Maintain selected altitude
5. X–Y slew/designate switch – Press and release when directly over the destination point

   The altitude error ((the difference between the barometric altitude (last valid reading) minus the destination point elevation, and the reference altitude)) is displayed in the CDU upper main display window.

To accept the altitude correction:

6. ENTR switchlight – Press

   The INS system altitude displayed in the CDU lower main display window is biased accordingly.

NOTE

In the event of an ADC failure, the CDU displays the last valid altitude from the ADC, and changes in aircraft altitude are not reflected on the CDU display except by the above method.

To reject the altitude correction:

7. CLR switchlight – Press

GLOSSARY

A

ADC	–	Air Data Computer
ARCP	–	Air Refueling Control Point
ARS	–	Automatic Recovery System
A/P	–	Autopilot
A/T	–	Autothrottle
A/T DISC	–	Autothrottle Disconnect
ATF	–	Actual Time of Fall
AVT	–	Automatic Video Track

B

BCK	–	Back
BGD	–	Background

C

CLOC	–	Captured Localizer
CMDI	–	Color Multipurpose Display Indicator
CNUP	–	Center North Up
CONS	–	Contrails
COR	–	Corridor
CRS	–	Course
CRS LINE	–	Course Line
CRSR	–	Cursor
CRS SEL	–	Course Select
CTUP	–	Center Track Up

D

DCH	–	Drift Corrected Heading
DCHC	–	Drift Corrected Heading Caret
DCLTR	–	Declutter
DDC	–	Disc Drive Cartridge
DEP	–	Data Entry Panel
DESC	–	Descend
DEST	–	Destination
DFRM	–	Data Frame
DLMS	–	Digital Land Mass System
DMAP	–	Digital Map
DNUP	–	Decenter North Up
DP	–	Destination Point
DSP	–	Display
DSS	–	Designator Select Switch
DSTS	–	Destination Select
DTUP	–	Decenter Track Up

GLOSSARY (Continued)

E

EDTS	–	Expanded Data Transfer System
ENTR	–	Enter
EO	–	Electro-Optical

F

FAAD	–	Flight Attitude Awareness System
FMS	–	Flight Management System
FNC	–	Function
FUNC	–	Function
FWD	–	Forward

G

H

HNAV	–	Horizontal Navigation
HNGSTL	–	Hung Store Left
HNGSTR	–	Hung Store Right
HSD	–	Horizontal Situation Display
HUD	–	Head-Up Display

I

ILSPRE	–	ILS Prelocalizer Capture
ILSLOC	–	ILS Localizer Capture

J

K

L

LOC	–	Localizer
LRU	–	Line Replaceable Unit

GLOSSARY (Continued)

M

MAN HDG	–	Manual Heading
MDC	–	Map Declutter
MDPS	–	Mission Data Processing System
MEA	–	Minimum Enroute Altitude
MPT	–	Manual Point Tracking
MSN ID	–	Mission Identification

N

NCC	–	Navigation Control Computer
N-DATA	–	Navigation Computer Data
NIAC	–	Navigation Interface and Autopilot Computer

O

OAP	–	Offset Aim Point
OAT	–	Outside Air Temperature
OCIP	–	Offensive Combat Improvement Program
OBFM	–	On Board Fault Monitor
OV	–	Overfly

P

P/L	–	Pitch Ladder
PAARS	–	Pilot Activated Automatic Recovery System
PMAP	–	Paper Map

Q

R

R-DATA	–	RLS Data
REFEL	–	Reference Elevation
RLS	–	Radar Locator System
RTB	–	Return To Base
RTN	–	Return

S

SCRL	–	Scroll
SNAV	–	Speed Navigation
SMD	–	Stores Management Display
SMS	–	Stores Management System

GLOSSARY (Continued)

SP	–	Starting Point
SYMBRT	–	Symbol Brightness

T

TDC	–	Tactical Declutter
TOP	–	Time Over Point
TOT	–	Time Over Target
TPC	–	Tactical Pilotage Chart
TRK C	–	Track Change
TTG	–	Time To Go

U

UDPT	–	Update

V

VNAV	–	Vertical Navigation
VSD	–	Vertical Situation Display
VTR	–	Video Tape Recorder
VV	–	Velocity Vector

W

WBI	–	Weapon Bay Improvement
W-DATA	–	Weapon Computer Data
WSC	–	Weapon System Computer

X

Y

Z

INDEX

A

Alerts 3-2, 3-3*
Altitude Calibration Update 4-43
Altitude Mode 4-30, FO-7*
AMAD Oil Pressure/Temperature Malfunction 3-1
APU Start 2-2
Autopilot and Autothrottle (A/P and A/T) 4-2
Autopilot and Autothrottle Controls and Indicators 4-2, 4-3*
    A/P Channel Selector Switch 4-2, 4-3*
    A/P Engage Switch 4-2, 4-3*
    A/T Channel Selector Switch 4-2, 4-3*
    A/T Engage Switch 4-2, 4-3*
    Autopilot Disconnect Light 4-3*, 4-4
    Autopilot Dual No Reference Lights 4-3*, 4-4
    Autothrottle Disconnect Light 4-3*, 4-4
    Control Stick 4-3, 4-3*
    Throttle 4-2, 4-3*
Autopilot and Autothrottle Modes (Unplanned) 4-30
    Altitude Modes 4-30, FO-7*
    Speed Modes 4-37, FO-7*
    Steering Modes 4-30, FO-7*
Autopilot Limits 4-4
Auxiliary Equipment 4-1
    Introduction 4-2
Auxiliary Navigation Panel 4-43

B

C

Color Multipurpose Display Indicators 4-5*, 4-11
    Common Display Data 4-13*
    EDIT Display 4-16, 4-17*
    Flight Attitude Awareness Display 4-26, 4-27*
    HSD Display 4-21, 4-23*
    Image Data Frame Display 4-18, 4-19*
    MAP Display 4-12, 4-15*
    SMD Display 4-24
    STATUS Display 4-24, 4-25*
    VSD Display 4-18, 4-20*
Control Stick 4-4, 4-3*
Cockpit Interior Check 2-1
Course Line Steering 4-32, 4-35*
Course Select Steering 4-34, 4-36*

D

Data Entry Panel 4-5*, 4-29, FO-7*
    General Rules 4-29
DEP Edit Displays 4-39, FO-7*
    Spreadsheeting 4-40

Page numbers with asterisk (*) denote illustration

INDEX (Continued)

DEP Functions, Miscellaneous 4-42
Description 1-1
  Introduction 1-1
Destination Steering 4-31, 4-33*
Displays 4-6
  EDIT Display (CMDI) 4-16, 4-17*
  EDIT Display (DEP) 4-41, FO-7*
  Flight Attitude Awareness Display (FAAD) 4-26, 4-27*
  HSD Display 4-21, 4-23*
  Image Data Frame Display 4-18, 4-19*
  MAP Display 4-12, 4-15*
  OCIP Basic Head-Up Display 4-6, 4-8*
  OCIP-HUD Display - ILS Steering 4-9, 4-10*
  OCIP-HUD Display - TACAN Steering 4-10, 4-11*
  SMD Display 4-24
  Status Display 4-24, 4-25*
  VSD Display 4-18, 4-20*

E

EDIT Display (CMDI) 4-16, 4-17*
EDIT Display (DEP) 4-41, FO-7*
Emergency Procedures 3-1
  Introduction 3-1
Engine Emergencies 3-1
  Engine Fire 3-1
  Engine Oil Pressure Malfunction 3-1
  Engine Overtemperature 3-1
  Engine Stall 3-1
Engine Fire Warning Lights 1-1
Engine Fire Warning System 1-1
Environmental Control System (ECS) 1-1, FO-5*
Environmental Control System Emergencies 3-2
  Dual Bleed Air Duct Overheat 3-2
  ECS Overheat 3-2
  Single Bleed Air Duct Overheat 3-2
Equipment Failure Alerts 3-2, 3-3*

F

Failure Alerts 3-2, 3-3*
FCS Prestart BIT Procedure 2-1
  NIAC SRT 2-1
Fire, Engine 3-1
Flight Attitude Awareness Display (FAAD) 4-26, 4-27*
Fuel System Emergencies 3-2
  Fuel Pressure Low Indication 3-2

G

General Rules (DEP) 4-29

H

HNAV 4-40

Page numbers with asterisk (*) denote illustration

INDEX (Continued)

HSD Display 4-21, 4-23*
HUD DEP Control Panel 4-4, 4-5*, FO-7*
HUD Displays 4-6
HUD Sensor Update 4-44

I

ILS Steering Mode 4-38
Image Data Frame Display 4-18, 4-19*
Inflight Emergencies 3-1
INS Failure 3-2
IRADS/MAP Update 4-44
IRADS Sensor Update 4-43
Introduction i

J

K

Keypad Entry Limits 4-43, FO-7*

L

Lights, Engine Fire Warning 1-1
Limits, Autopilot 4-4
Limits, Keypad Entry 4-40, FO-7*

M

Manual Heading Steering Mode 4-37
MAP Display 4-12, 4-15*
Map Symbology 4-14*
MARK (Reconnaissance Point Identification) 4-45
Miscellaneous DEP Functions 4-42
    MAP Destination Point (MAP DP) 4-42
    Record (RCRD) 4-42
    Terrain Monitor/Search (TM/SRCH) 4-42
    Track Select (TRK SEL) 4-42

N

NIAC SRT 2-1
Normal Procedures 2-1
    APU Start 2-2
    Cockpit Interior Check 2-1
    FCS Prestart BIT Procedure 2-1
    Introduction 2-1
    NIAC SRT 2-1
    Right Console Check 2-1

O

OCIP Basic Head-Up Display 4-6, 4-8*
OCIP-HUD Declutter Levels 4-10
OCIP-HUD Displays 4-6
OCIP-HUD Display – ILS Steering 4-9, 4-10*
OCIP-HUD Display – Navigation Steering 4-11, 4-12*

Page numbers with asterisk (*) denote illustration

INDEX (Continued)

OCIP-HUD Display - TACAN Steering 4-10, 4-11*
Offensive Combat Improvement Program 1-1
Oil Pressure Malfunction, Engine 3-1
Overfly Steering 4-43
Overtemperature, Engine 3-1

P

Pilot Activated Automatic Recovery System (PAARS) 4-6, 4-7*
Pre-Planned Modes 4-40
    HNAV 4-40
    SNAV 4-40
    Time Over Target (TOT) 4-40
    VNAV 4-40

Q

R

Record (RCRD) 4-42
Return To Base (RTB) Mode 4-26, 4-28*
Right Console Check 2-1

S

Safe Corridor 4-29
Sensor Updates 4-43
    Altitude Calibration 4-45
    HUD Sensor Update 4-44
    IRADS/MAP Update 4-44
    IRADS Sensor Update 4-43
    MARK (Reconnaissance Point Identification) 4-45
SMD Display 4-24
SNAV 4-40
Speed Modes 4-39
    Time Over Point (TOP) 4-39
Spreadsheeting 4-42
Starter Engaged Light (Inflight) 3-1
Status Display 4-24, 4-25*
Steering Modes 4-30
    Course Line Steering 4-32, 4-35*
    Course Select Steering 4-34, 4-36*
    Destination Steering 4-31, 4-33*
    ILS Steering 4-38
    Manual Heading Steering 4-37
    TACAN Steering 4-37

T

TACAN Steering Mode 4-37
Terrain Monitor/Search (TM/SRCH) 4-42
Throttle 4-4, 4-3*
Time Over Point (TOP) 4-39
Time Over Target (TOT) 4-40

Page numbers with asterisk (*) denote illustration

INDEX (Continued)

Track Select (TRK SEL) 4-42
Turn Short/Overfly Steering 4-43

U

Unplanned Autopilot/Autothrottle Modes 4-30
Updates, Sensor 4-43
  Altitude Calibration 4-45
  HUD 4-44
  IRADS/MAP 4-44
  IRADS 4-43
  MARK 4-45

V

Visual Update 4-44
VNAV 4-40
VSD Display 4-18, 4-20*

W

X

Y

Z

Page numbers with asterisk (*) denote illustration

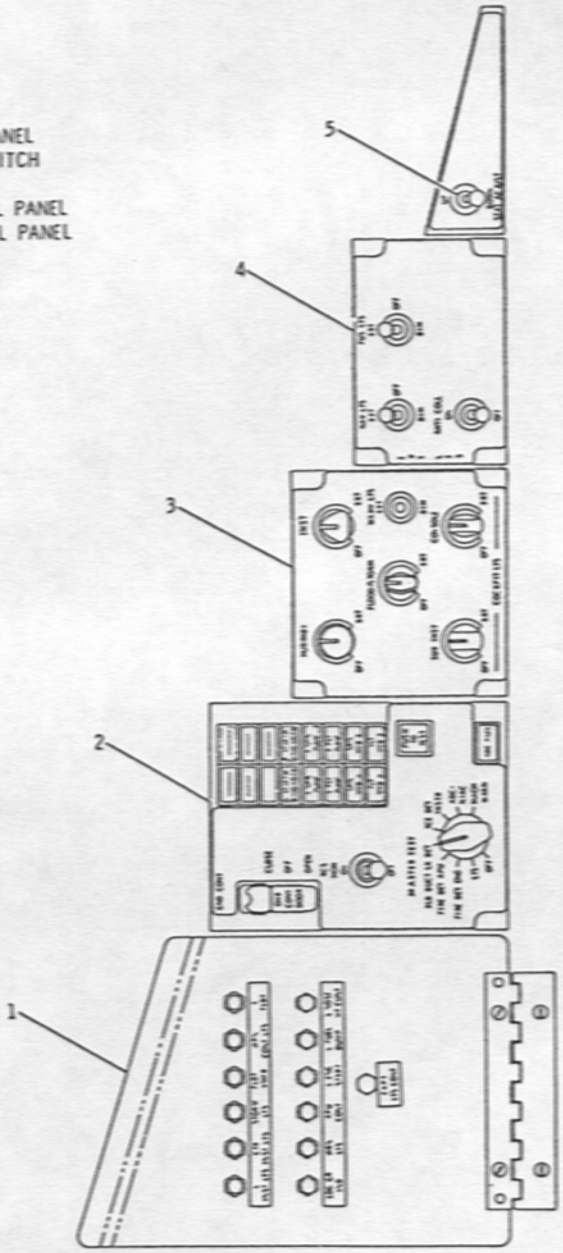
FOLDOUT ILLUSTRATIONS

TABLE OF CONTENTS

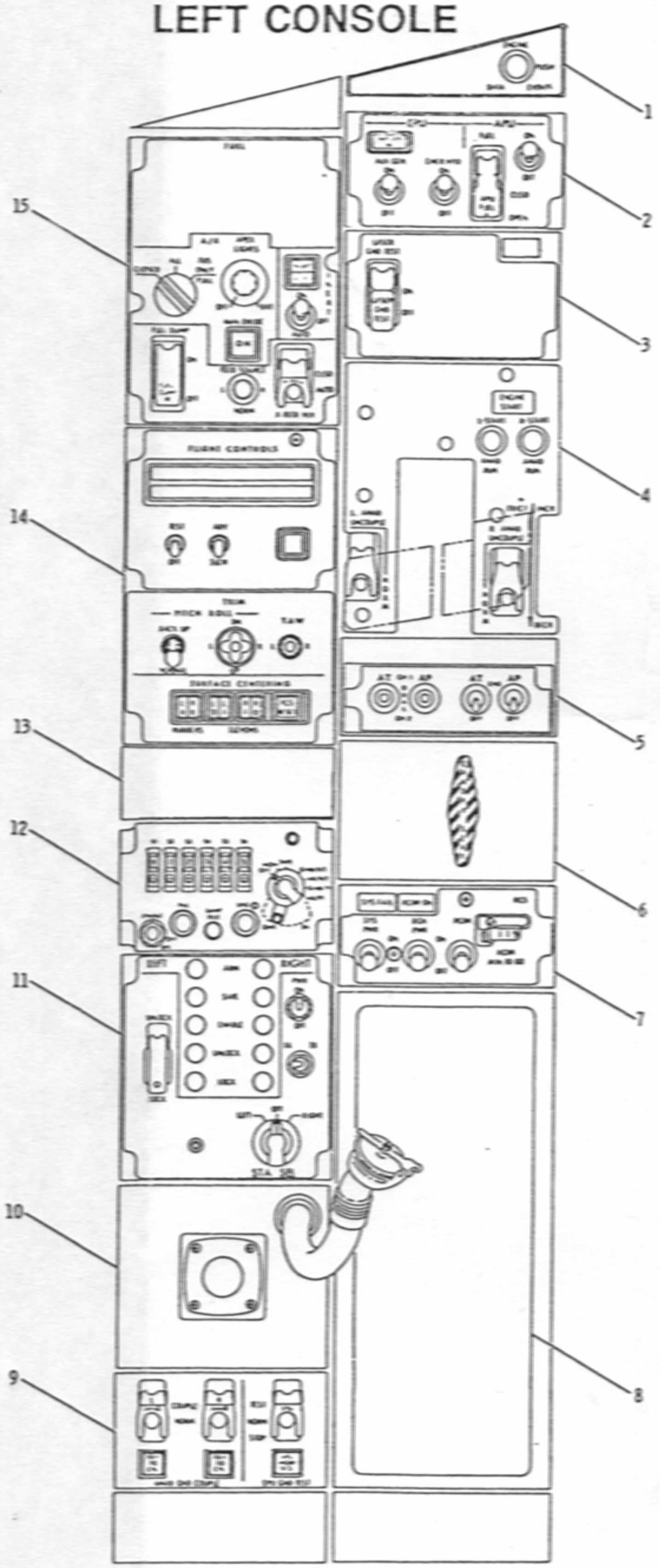
Figure No.	Title	Page
FO-1	Cockpit Arrangement (OCIP Aircraft)	FO-3/(FO-4 Blank)
FO-2	Environmental Control System (OCIP Aircraft)	FO-5/(FO-6 Blank)
FO-3	Data Entry Panel Displays (Sheet 1 of 2)	FO-7/(FO-8 Blank)
FO-3	Data Entry Panel Displays (Sheet 2 of 2)	FO-9/(FO-10 Blank)

LEFT SIDE PANELS

1 LEFT CIRCUIT BREAKER PANEL
2 WEAPON BAY GROUND SWITCH
  AND MASTER TEST PANEL
3 COCKPIT LIGHTS CONTROL PANEL
4 EXTERNAL LIGHTS CONTROL PANEL
5 SEAT ADJUST SWITCH



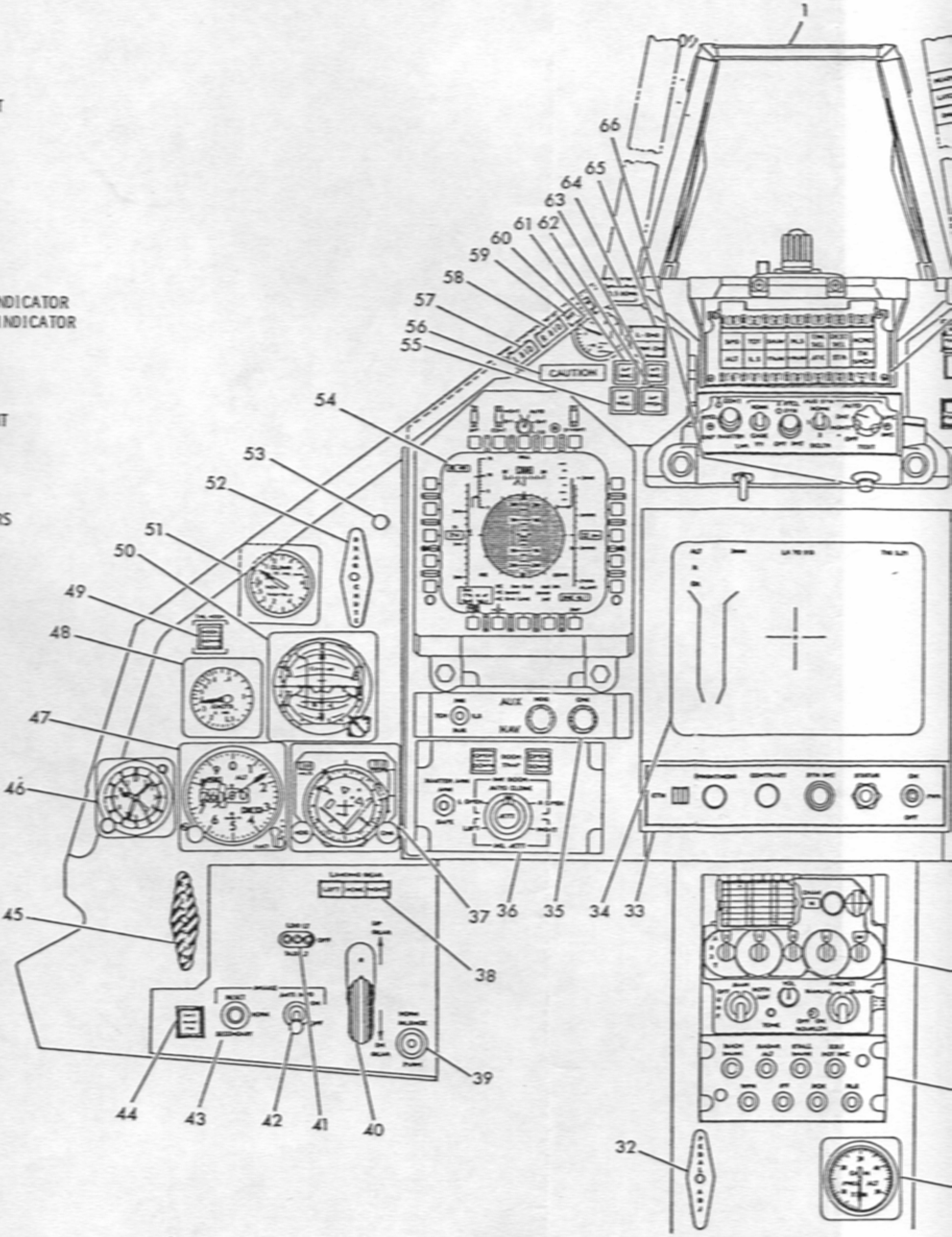
LEFT CONSOLE



1 ENGINE DATA EVENTS SWITCH
2 EPU/APU PANEL
3 LASER CONTROL PANEL
4 THROTTLE PANEL
5 AUTOPILOT/AUTOTHROTTLE CONTROL PANEL
6 CANOPY/SEAT EJECTION HANDLE
7 LOW OBSERVABLE RECORDER CONTROL PANEL
8 MAP AND LET DOWN BOOK CONTAINER
9 AMAD/EPU GROUND CONTROL PANEL
10 ANTI-G SUIT VALVE
11 WEAPON INTERFACE PANEL
12 PAL/AMAC (DCU-201) WEAPONS CONTROLLER
13 BLANK
14 FCS PANEL
15 FUEL CONTROL PANEL

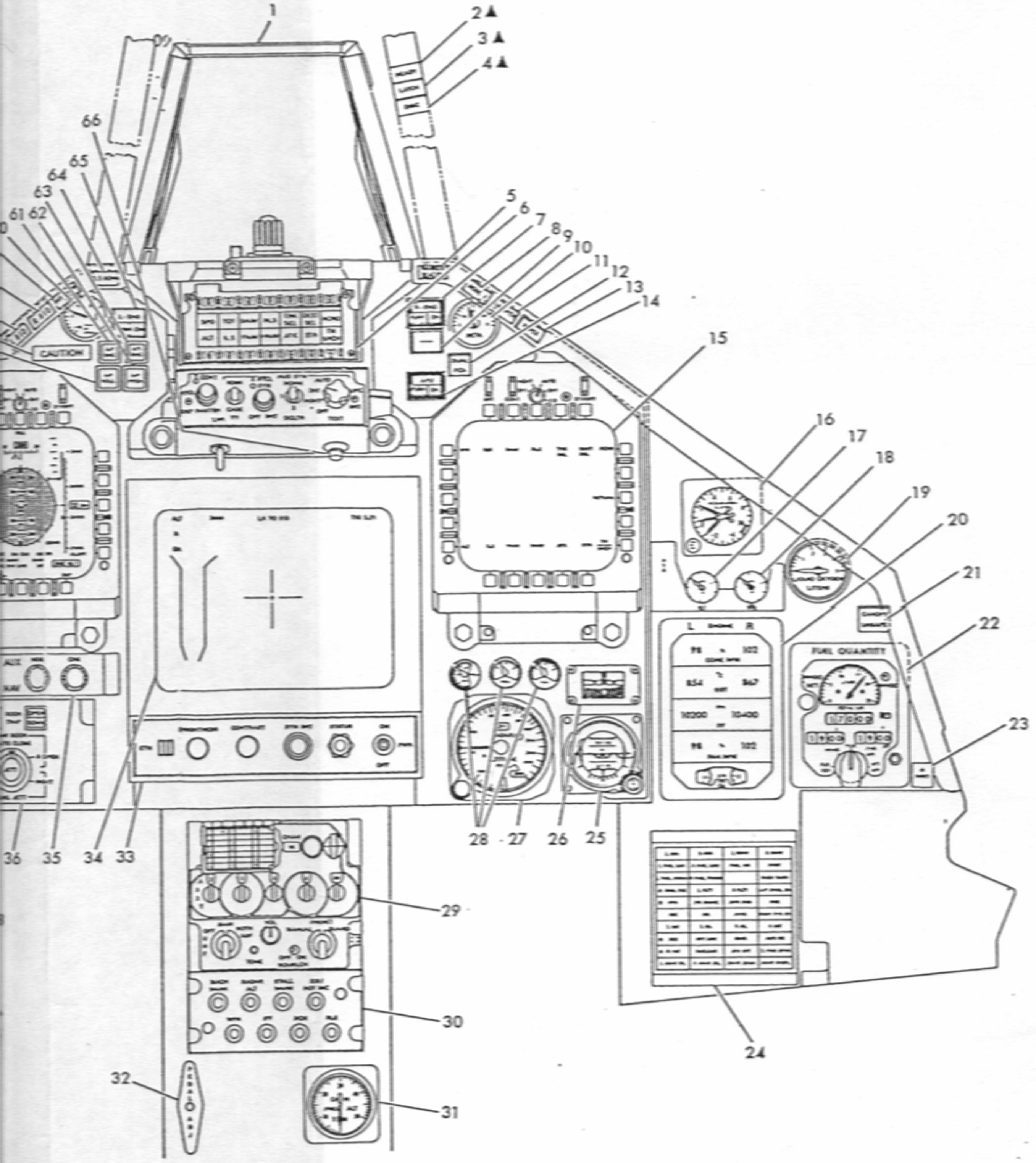
1 HUD PROJECTION DISPLAY UNIT
2 AIR REFUELING READY LIGHT
3 AIR REFUELING LATCH LIGHT
4 AIR REFUELING DISCONNECT LIGHT
5 MARKER BEACON LIGHT
6 DATA ENTRY PANEL
7 RIGHT ENGINE FUEL CUTOFF SWITCHLIGHT
8 IFF MODE 4 LIGHT
9 BLANK
10 BETA INDICATOR
11 AIR REFUELING RECEPTACLE OPEN LIGHT
12 DUAL FCS LIGHT
13 INLET GRID WIPER LIGHT
14 APU FUEL CUTOFF SWITCHLIGHT
15 RIGHT CMDI
16 ACCELEROMETER
17 FLIGHT HYDRAULIC SYSTEM PRESSURE INDICATOR
18 UTILITY HYDRAULIC SYSTEM PRESSURE INDICATOR
19 OXYGEN QUANTITY INDICATOR
20 ENGINE PERFORMANCE INDICATOR
21 CANOPY UNSAFE LIGHT
22 FUEL QUANTITY INDICATOR
23 ANNUNCIATOR PANEL RESET SWITCHLIGHT
24 ANNUNCIATOR PANEL
25 STANDBY ATTITUDE INDICATOR
26 TURN AND SLIP INDICATOR
27 RADAR ALTIMETER
28 PITCH, ROLL, AND YAW TRIM INDICATORS
29 UHF RADIO CONTROL PANEL
30 ICS PANEL
31 CABIN PRESSURE ALTIMETER
32 PEDAL ADJUST HANDLE
33 SENSOR DISPLAY CONTROL
34 SENSOR DISPLAY
35 AUXILIARY NAVIGATION PANEL
36 ARMAMENT CONTROL PANEL
37 HORIZONTAL SITUATION INDICATOR
38 LANDING GEAR INDICATOR LIGHTS
39 LANDING GEAR HORN SILENCE SWITCH
40 LANDING GEAR CONTROL HANDLE
41 LANDING/TAXI LIGHTS SWITCH
42 BRAKE ANTI-SKID SWITCH
43 BRAKE SYSTEM SELECT SWITCH
44 EMERGENCY BRAKE SWITCHLIGHT
45 EMERGENCY GEAR EXTENSION HANDLE
46 24-HR CLOCK
47 ALTIMETER
48 AIRSPEED INDICATOR
49 TAIL HOOK DOWN SWITCHLIGHT
50 ATTITUDE INDICATOR
51 VERTICAL VELOCITY INDICATOR
52 DRAG CHUTE DEPLOYMENT HANDLE
53 DRAG CHUTE STOW RESET BUTTON
54 LEFT CMDI
55 AUTOPILOT ROLL LIGHT
56 MASTER CAUTION LIGHT
57 LEFT BLOW-IN DOOR LIGHT
58 RIGHT BLOW-IN DOOR LIGHT
59 ANTENNA DOWN LIGHT
60 ANGLE OF ATTACK
61 AUTOPILOT DISCONNECT LIGHT
62 AUTOPILOT PITCH LIGHT
63 AUTOTHROTTLE DISCONNECT LIGHT
64 RLS DOWN LIGHT
65 LEFT ENGINE FUEL CUTOFF SWITCHLIGHT
66 DEP RELOAD BUTTON

MAIN INSTRUMENT PANE



▲ LOCATED ON CANOPY FRAME

MAIN INSTRUMENT PANEL

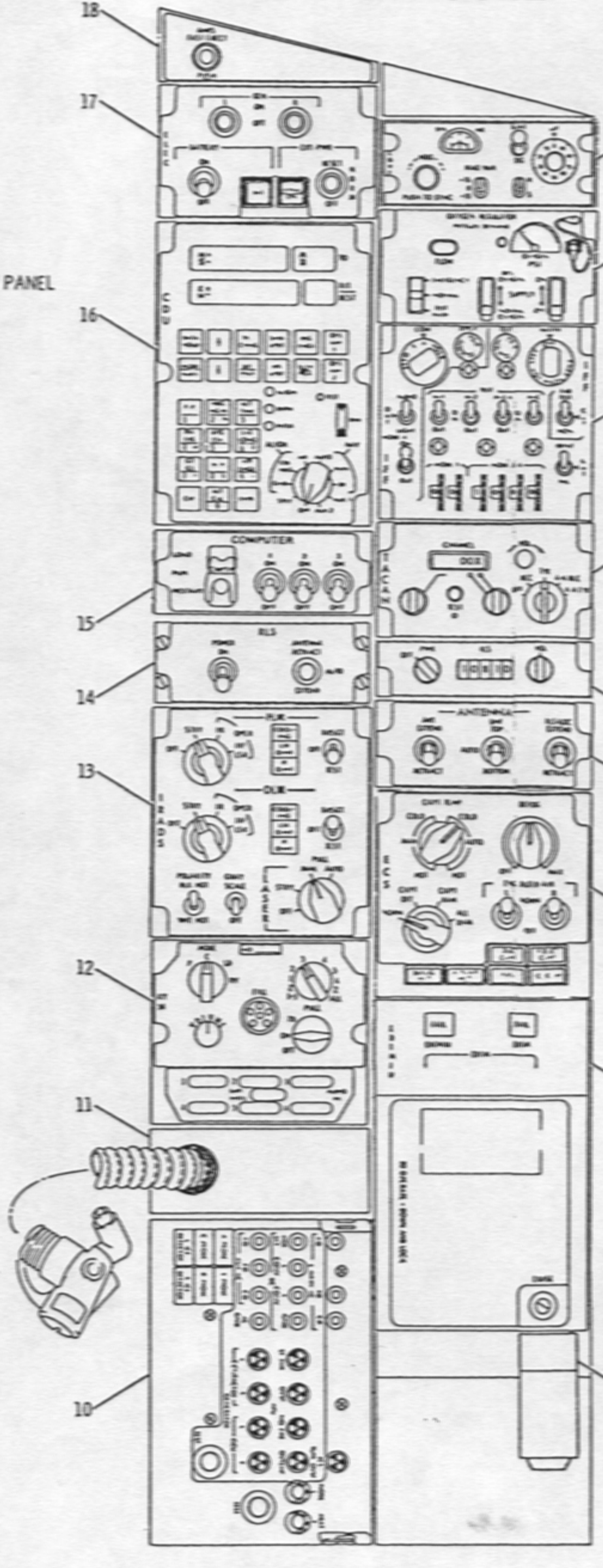


1 AHRS C
2 OXYGEN
3 IFF CON
4 TACAN
5 ILS/MA
6 ANTENN
7 ECS CO
8 EXPAND
9 UTILITY
10 ELECTRI
11 OXYGEN
12 KY-58 C
13 IRADS
14 RLS PA
15 COMPUT
16 INS CO
17 ELECTRI
18 AHRS F

COCKPIT ARR

RIGHT CONSOLE

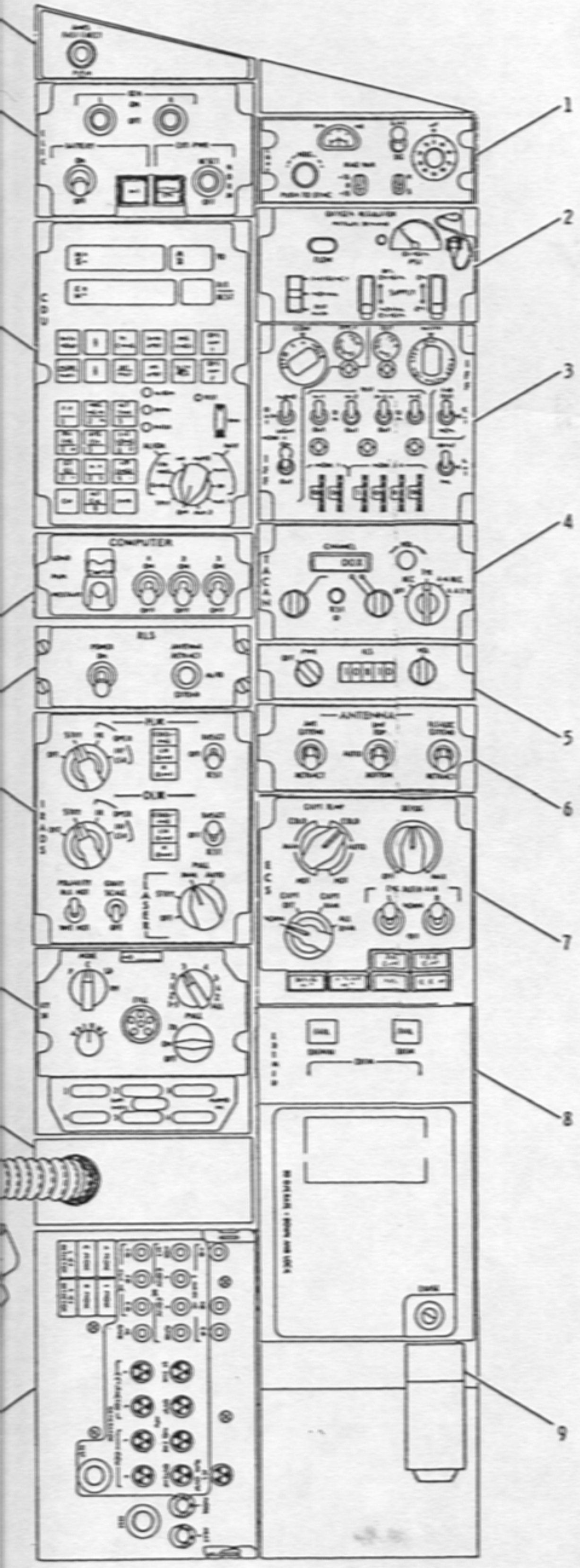
1 AHRS CONTROL PANEL
2 OXYGEN CONTROL PANEL
3 IFF CONTROL PANEL
4 TACAN CONTROL PANEL
5 ILS/MARKER BEACON PANEL
6 ANTENNA CONTROL PANEL
7 ECS CONTROL PANEL
8 EXPANDED DATA TRANSFER MODULE INTERFACE UNIT PANEL
9 UTILITY LIGHT
10 ELECTRICAL FAULT INDICATOR PANEL
11 OXYGEN HOSE
12 KY-58 CONTROL PANEL (PROVISIONS ONLY)
13 IRADS PANEL
14 RLS PANEL
15 COMPUTER PANEL
16 INS CONTROL AND DISPLAY UNIT PANEL
17 ELECTRICAL PANEL
18 AHRS FAST ERECT PANEL



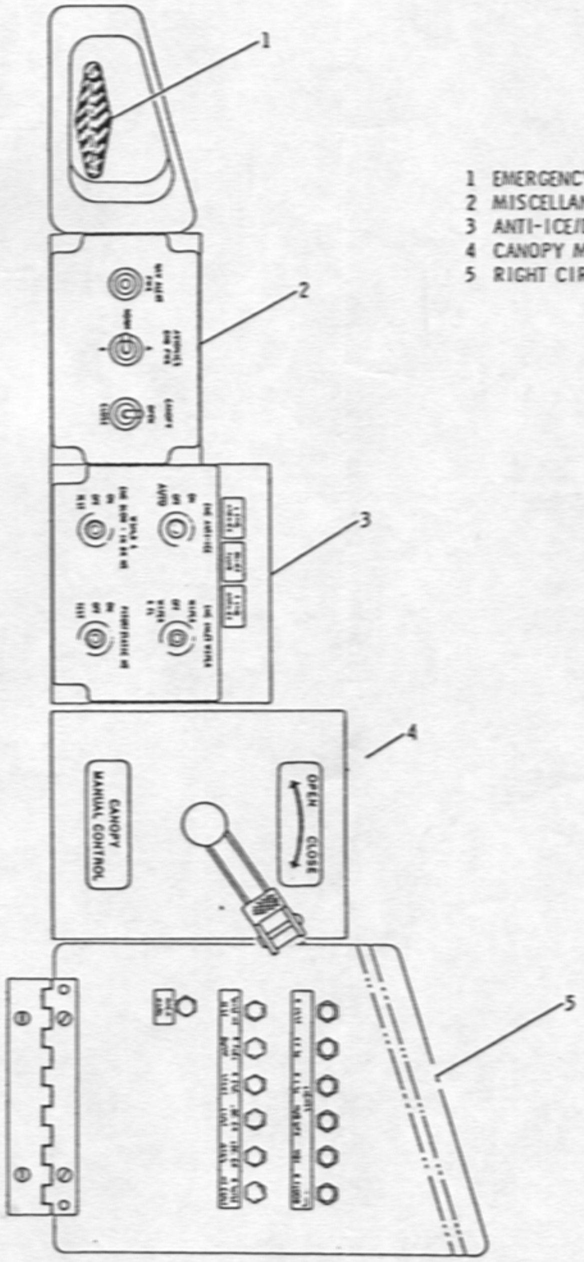
FIGU

COCKPIT ARRANGEMENT (OCIP AIRCRAFT)

RIGHT CONSOLE



RIGHT SIDE PANELS



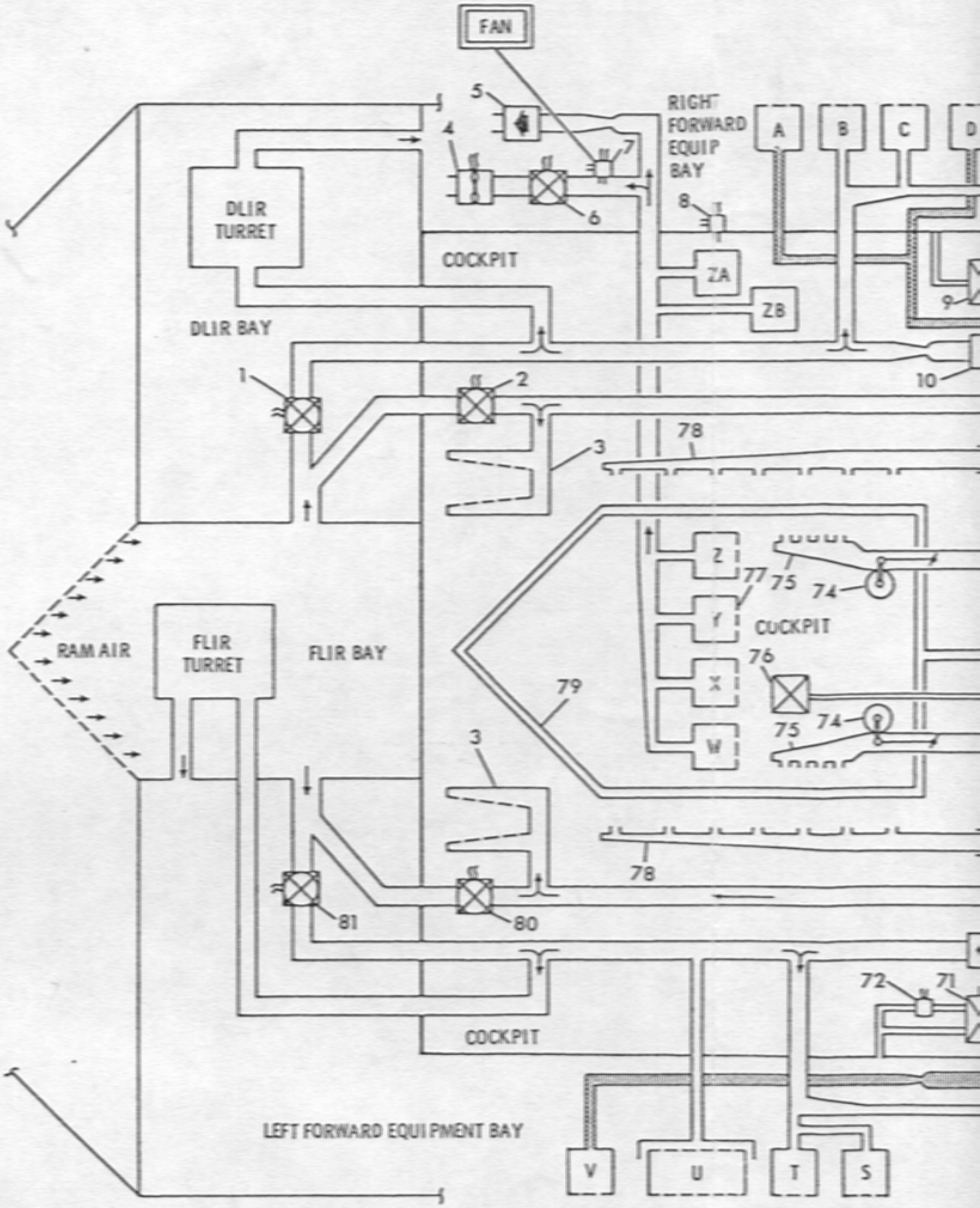
1 EMERGENCY AIR REFUELING HANDLE
2 MISCELLANEOUS SWITCH PANEL
3 ANTI-ICE/DEICE PANEL
4 CANOPY MANUAL CRANK HANDLE
5 RIGHT CIRCUIT BREAKER PANEL

F213-OCIP-FO-1(b)

FIGURE FO-1

1 RIGHT EQUIPMENT EMERGENCY COOLING AIR SHUTOFF VALVE
2 RIGHT COCKPIT EMERGENCY COOLING AIR SHUTOFF VALVE
3 COCKPIT AIR OUTLETS-LEFT AND RIGHT FOOTWARMERS
4 COCKPIT AVIONICS COOLING AIR EXHAUST FAN
5 COCKPIT AVIONICS COOLING AIR EXHAUST CHECK VALVE
6 COCKPIT AVIONICS COOLING AIR EXHAUST SHUTOFF VALVE
7 COCKPIT AVIONICS COOLING AIR EXHAUST FAN FLOW SENSOR (FAN FAIL WARNING LIGHT)
8 COCKPIT DIFFERENTIAL PRESSURE SWITCH
9 COCKPIT PRESSURE REGULATOR
10 RIGHT FORWARD AVIONICS COOLING AIR CHECK VALVE
11 GROUND AIR CONDITIONING CONNECTION
12 GROUND AIR CONDITIONING CHECK VALVE
13 CANOPY SEAL SHUTOFF VALVE
14 CANOPY SEAL LOW PRESSURE CHECK VALVE
15 CANOPY SEAL PRESSURE REGULATOR
16 CANOPY SEAL HIGH PRESSURE
17 FLIGHT CONTROL COMPUTER COOLING AIR FLOW SENSOR
18 COCKPIT AIR TO DEFOG SYSTEM CHECK VALVE
19 DEFOG SYSTEM HOT AIR CONTROL VALVE
20 HOT AIR MANIFOLD OVERTEMPERATURE SWITCH
21 ECS PACKAGE OVERTEMPERATURE SWITCH
22 HOT AIR MANIFOLD TEMPERATURE CONTROL PNEUMATIC THERMOSTAT
23 HOT AIR MANIFOLD OVERTEMPERATURE PNEUMATIC THERMOSTAT
24 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
25 CONTROL PRESSURE ORIFICE TEE
26 CONTROL PRESSURE REGULATOR
27 PARTICLE SEPARATOR AND FILTER
28 HEAT EXCHANGER DISCHARGE CHECK VALVE
29 ECS TURBINE OVERSPEED SENSING SWITCH
30 ECS AIR FLOW CONTROL AND SHUTOFF VALVES
31 ECS AIR PRESSURE REGULATOR VALVE
32 CROSSBLEED SHUTOFF VALVES
33 STARTER AIR VALVES
34 GROUND AIR START CONNECTION AND CHECK VALVE
35 APU CHECK VALVE
36 PNEUMATIC THERMOSTATS
37 BITE PRESSURE INDICATOR
38 BLEED AIR PRESSURE REGULATOR AND SHUTOFF VALVES
39 LOW STAGE BLEED AIR CHECK VALVES
40 HIGH STAGE BLEED AIR REGULATOR VALVES

41 APU ISOLATION VALVES
42 PASS SHUTOFF VALVES
43 EPU ISOLATION VALVE
44 WATER ASPIRATOR
45 ECS AIRFLOW CONTROL PNEUMATIC THERMOSTAT
46 RAM AIR BYPASS CHECK VALVE
47 HEAT EXCHANGER
48 AIR CYCLE COOLING TURBINE-FAN
49 NON-ICE TEMPERATURE CONTROL VALVE
50 AIR CYCLE MIXING MUFF COOLING TURBINE
51 WATER SEPARATOR
52 NON-ICE OVERTEMPERATURE PNEUMATIC THERMOSTAT
53 NON-ICE TEMPERATURE CONTROL/ SENSOR
54 AVIONICS COOLING AIR TEMPERATURE CONTROL VALVE (60° F SUPPLY)
55 AVIONICS COOLING AIR MIXING MUFF (60° F SUPPLY)
56 AVIONICS COOLING AIR OVERTEMPERATURE THERMOSTAT
57 AVIONICS COOLING AIR TEMPERATURE CONTROL/ SENSOR (60° F SUPPLY)
58 COCKPIT AIR MIXING MUFF
59 COCKPIT COLD AIR CHECK VALVE
60 COCKPIT HOT AIR CHECK VALVE
61 COCKPIT AIR TEMPERATURE CONTROL VALVE
62 COCKPIT MASS FLOW CONTROL AND SHUTOFF VALVE
63 COCKPIT AIR OVERTEMPERATURE PNEUMATIC THERMOSTAT
64 ⚠1 COCKPIT AIR TEMPERATURE CONTROL/ SENSOR
65 AVIONICS COOLING AIR MIXING MUFF (80° F SUPPLY)
66 AVIONICS COOLING AIR TEMPERATURE CONTROL VALVE (80° F SUPPLY)
67 AVIONICS COOLING AIR OVERTEMPERATURE SWITCH (AVN AIR HOT WARNING LIGHT)
68 AVIONICS COOLING AIR OVERTEMPERATURE CONTROL/ SENSOR (80° F SUPPLY)
69 AVIONICS COOLING AIR OVERTEMPERATURE PNEUMATIC THERMOSTAT (80° F SUPPLY)
70 AVIONICS COOLING AIR PRESSURE SWITCH
71 COCKPIT PRESSURE SAFETY AND DUMP VALVE
72 COCKPIT PRESSURE DUMP SOLENOID
73 LEFT FORWARD AVIONICS COOLING AIR CHECK VALVE
74 CANOPY SILL AIR CONTROL VALVE
75 CANOPY SILL LEVEL OUTLETS
76 ANTI-G SUIT VALVE
77 TYPICAL AVIONICS COOLING INSTALLATION
78 DEFOG AIR OUTLETS - LEFT AND RIGHT CANOPY
79 CANOPY SEAL
80 LEFT COCKPIT EMERGENCY COOLING AIR SHUTOFF VALVE
81 LEFT EQUIPMENT EMERGENCY COOLING AIR SHUTOFF VALVE

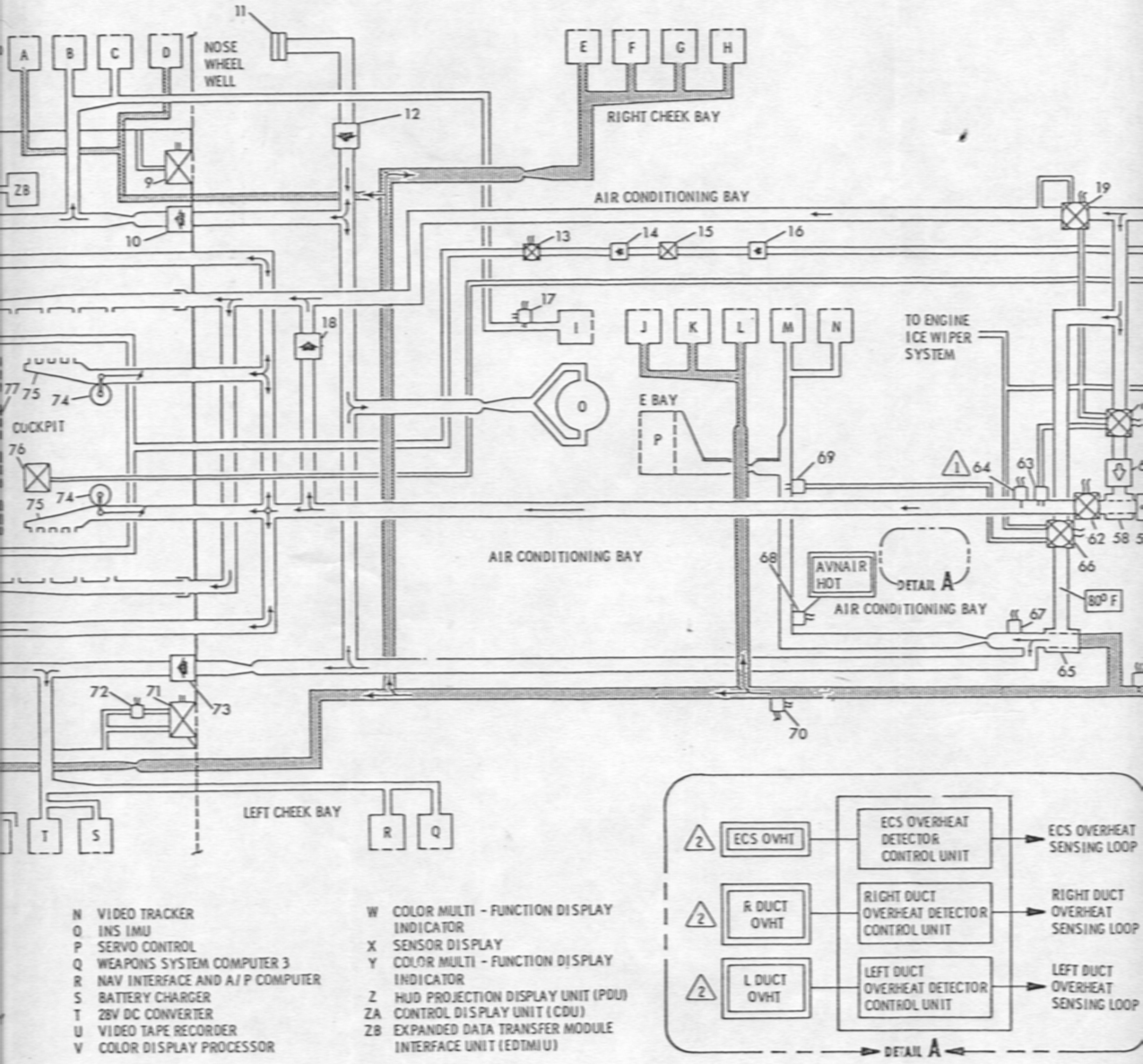


AVIONICS EQUIPMENT (REF ONLY)

A LOCATING SYSTEM COMPUTER
B AIR DATA COMPUTER
C 28V DC CONVERTER
D MAP DISPLAY PROCESSOR
E INTERFACE ELECTRONIC UNIT (NAV)
F WEAPONS SYSTEM COMPUTER 1

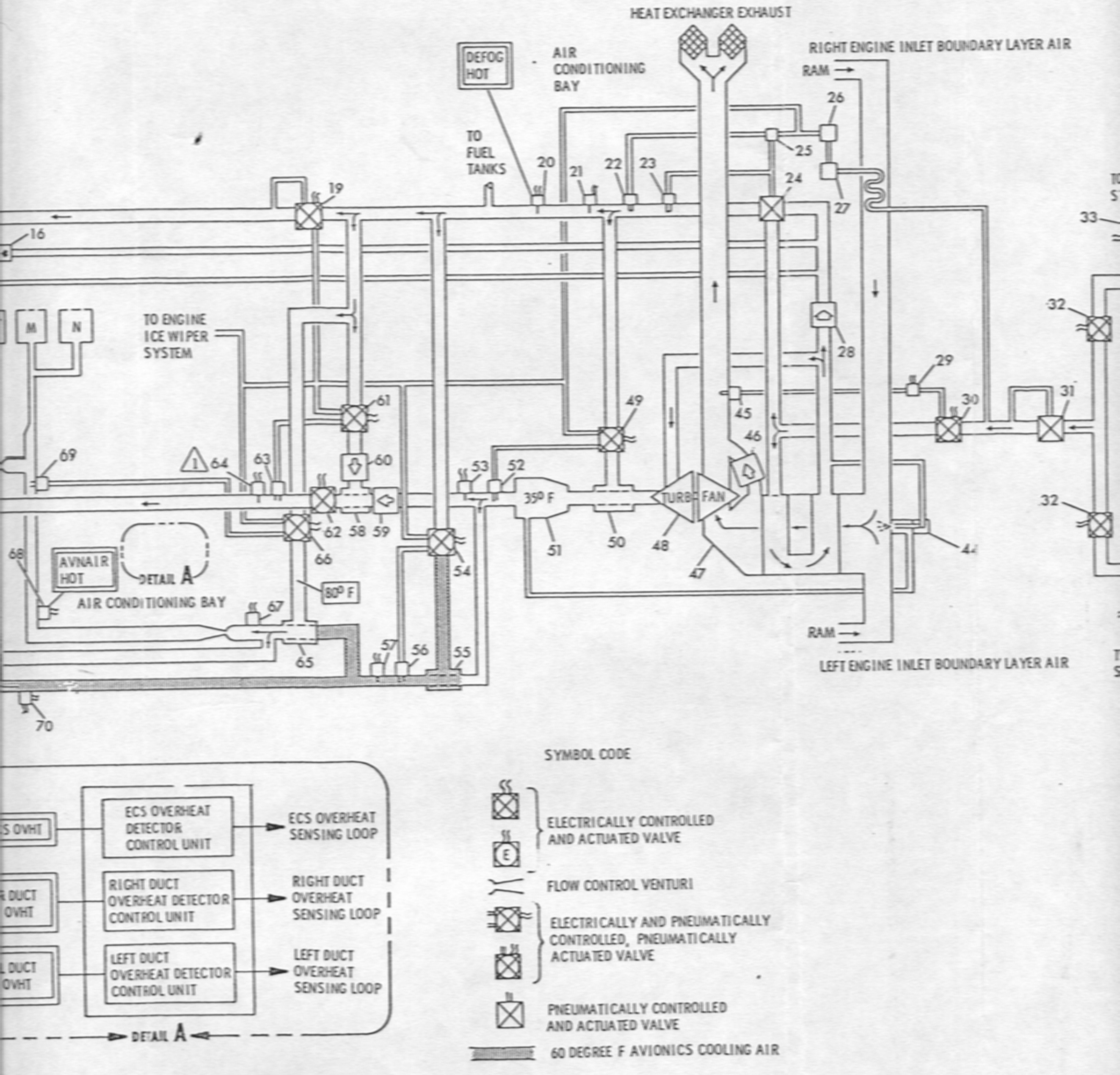
G WEAPONS SYSTEM COMPUTER 2
H CARGO MANAGEMENT SYSTEM
I FLIGHT CONTROL COMPUTER
J POWER SUPPLY - LS
K INTERFACE UNIT - LS
L LOCAL OSCILLATOR/ FREQUENCY SYNTHESIZER
M IF PROCESSOR - LS

N VIDEO TRACKE
O INS IMU
P SERVO CONTR
Q WEAPONS SYS
R NAV INTERFAC
S BATTERY CHAR
T 28V DC CONVE
U VIDEO TAPE RE
V COLOR DISPLA

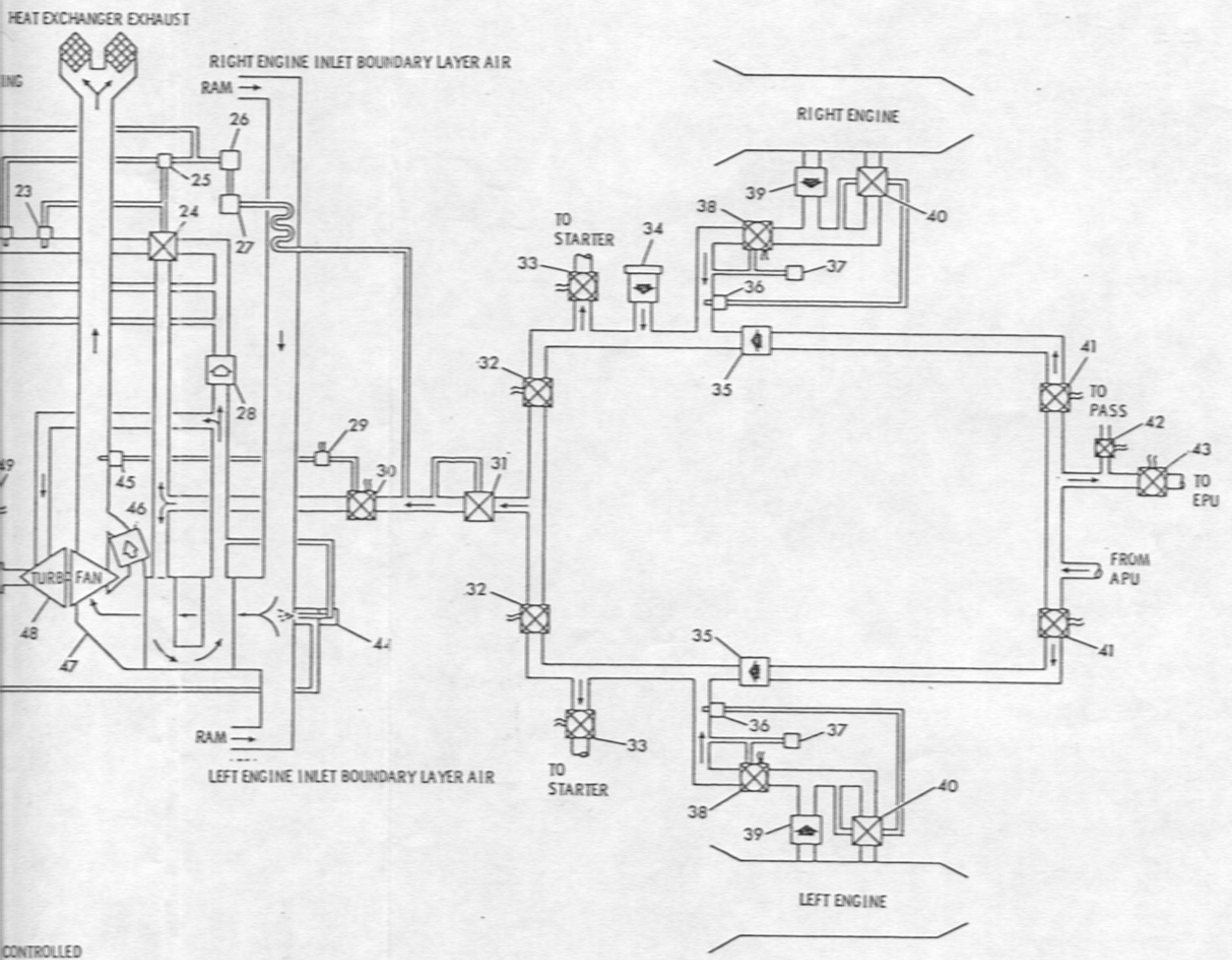


N	VIDEO TRACKER
O	INS IMU
P	SERVO CONTROL
Q	WEAPONS SYSTEM COMPUTER 3
R	NAV INTERFACE AND A/P COMPUTER
S	BATTERY CHARGER
T	28V DC CONVERTER
U	VIDEO TAPE RECORDER
V	COLOR DISPLAY PROCESSOR
W	COLOR MULTI - FUNCTION DISPLAY INDICATOR
X	SENSOR DISPLAY
Y	COLOR MULTI - FUNCTION DISPLAY INDICATOR
Z	HUD PROJECTION DISPLAY UNIT (PDU)
ZA	CONTROL DISPLAY UNIT (CDU)
ZB	EXPANDED DATA TRANSFER MODULE INTERFACE UNIT (EDTMIU)

ENVIRONMENTAL



ENVIRONMENTAL CONTROL SYSTEM (OCIP AIRCRAFT)



CONTROLLED
VALVE

VENTURI

AND PNEUMATICALLY
PNEUMATICALLY
VE

Y CONTROLLED
VALVE

VIONICS COOLING AIR

NOTE

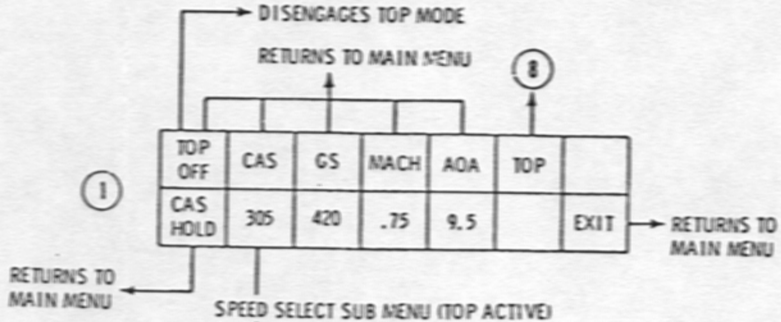
1. 40° - 160° adjustable cockpit air temperature range

2. The ECS OVHT, L DUCT OVHT, and R DUCT OVHT warning lights are illuminated when associated duct overheat sensing loop temperature exceeds 310° F.

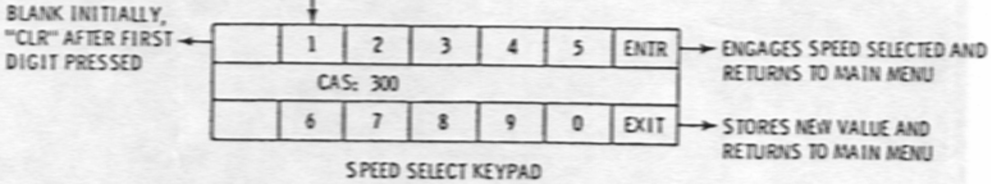
F213-OCIP-FO-2(p)

FIGURE FO-2

①

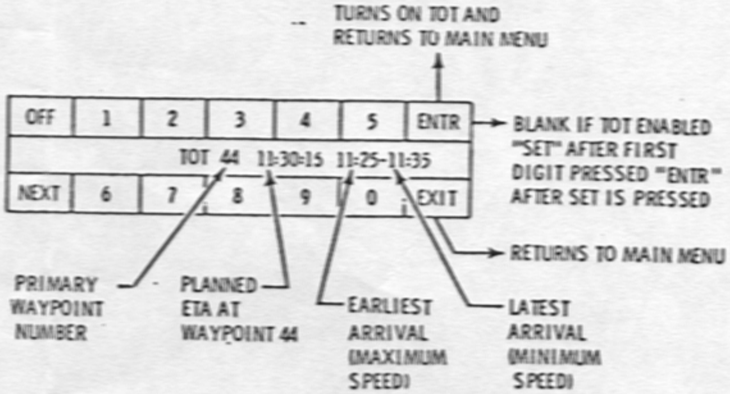


SPEED SELECT SUB MENU (TOP ACTIVE)


BLANK INITIALLY, "CLR" AFTER FIRST DIGIT PRESSED
1
2
3
4
5
ENTR
CAS: 300
6
7
8
9
0
EXIT
ENGAGES SPEED SELECTED AND RETURNS TO MAIN MENU
STORES NEW VALUE AND RETURNS TO MAIN MENU

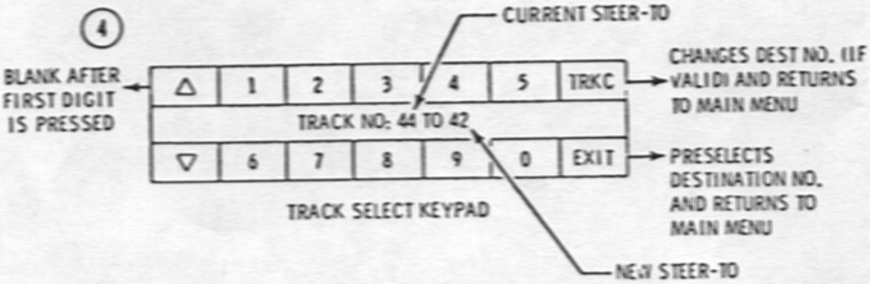
SPEED SELECT KEYPAD

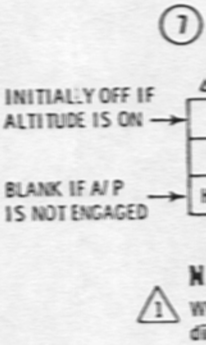
②


TURNS ON TOT AND RETURNS TO MAIN MENU
OFF
1
2
3
4
5
ENTR
TOT 44 11:30:15 11:25-11:35
NEXT
6
7
8
9
0
EXIT
BLANK IF TOT ENABLED "SET" AFTER FIRST DIGIT PRESSED "ENTR" AFTER SET IS PRESSED
RETURNS TO MAIN MENU
PRIMARY WAYPOINT NUMBER
PLANNED ETA AT WAYPOINT 44
EARLIEST ARRIVAL (MAXIMUM SPEED)
LATEST ARRIVAL (MINIMUM SPEED)

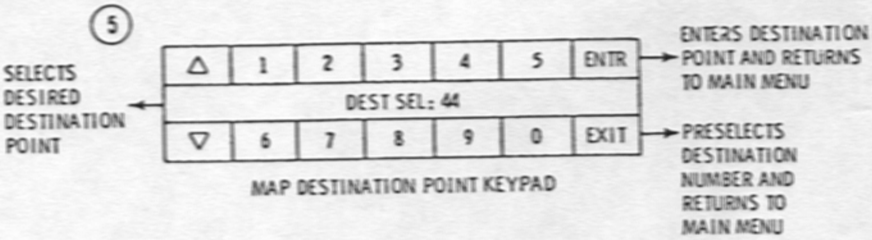
TOT KEYPAD

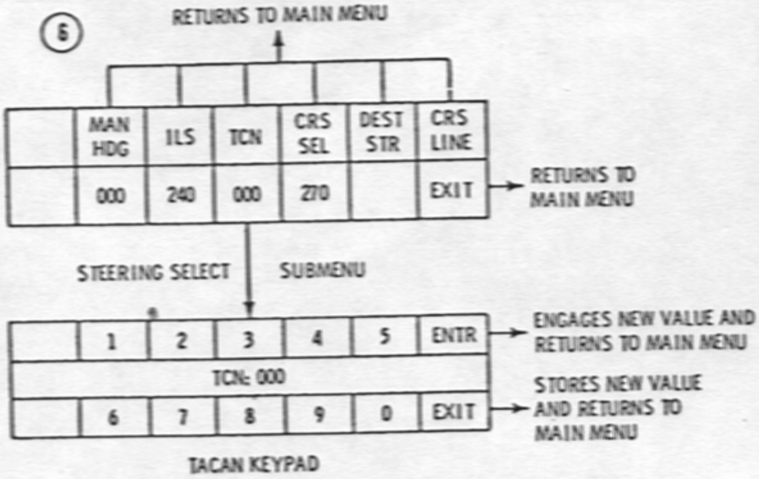
③ SEE SHEET 2

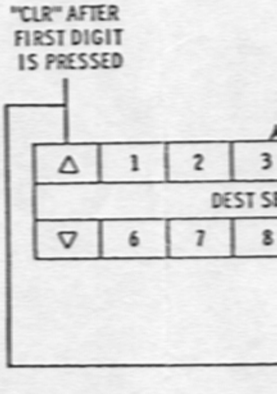

④
CURRENT STEER-TO
BLANK AFTER FIRST DIGIT IS PRESSED
△
1
2
3
4
5
TRKC
CHANGES DEST NO. (IF VALID) AND RETURNS TO MAIN MENU
TRACK NO: 44 TO 42
▽
6
7
8
9
0
EXIT
PRESELECTS DESTINATION NO. AND RETURNS TO MAIN MENU
TRACK SELECT KEYPAD
NEW STEER-TO


⑦
INITIALLY OFF IF ALTITUDE IS ON
BLANK IF A/P IS NOT ENGAGED

AND


⑤
SELECTS DESIRED DESTINATION POINT
△
1
2
3
4
5
ENTR
ENTERS DESTINATION POINT AND RETURNS TO MAIN MENU
DEST SEL: 44
▽
6
7
8
9
0
EXIT
PRESELECTS DESTINATION NUMBER AND RETURNS TO MAIN MENU
MAP DESTINATION POINT KEYPAD


⑥
RETURNS TO MAIN MENU
MAN HDG
ILS
TCN
CRS SEL
DEST STR
CRS LINE
000
240
000
270
EXIT
RETURNS TO MAIN MENU
STEERING SELECT
SUBMENU
1
2
3
4
5
ENTR
ENGAGES NEW VALUE AND RETURNS TO MAIN MENU
TCN: 000
6
7
8
9
0
EXIT
STORES NEW VALUE AND RETURNS TO MAIN MENU
TACAN KEYPAD

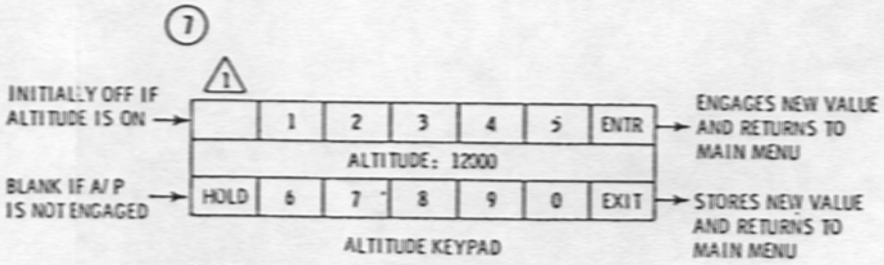

"CLR" AFTER FIRST DIGIT IS PRESSED
△
DEST SE
▽

ND. (IF
TURNS

D.
D

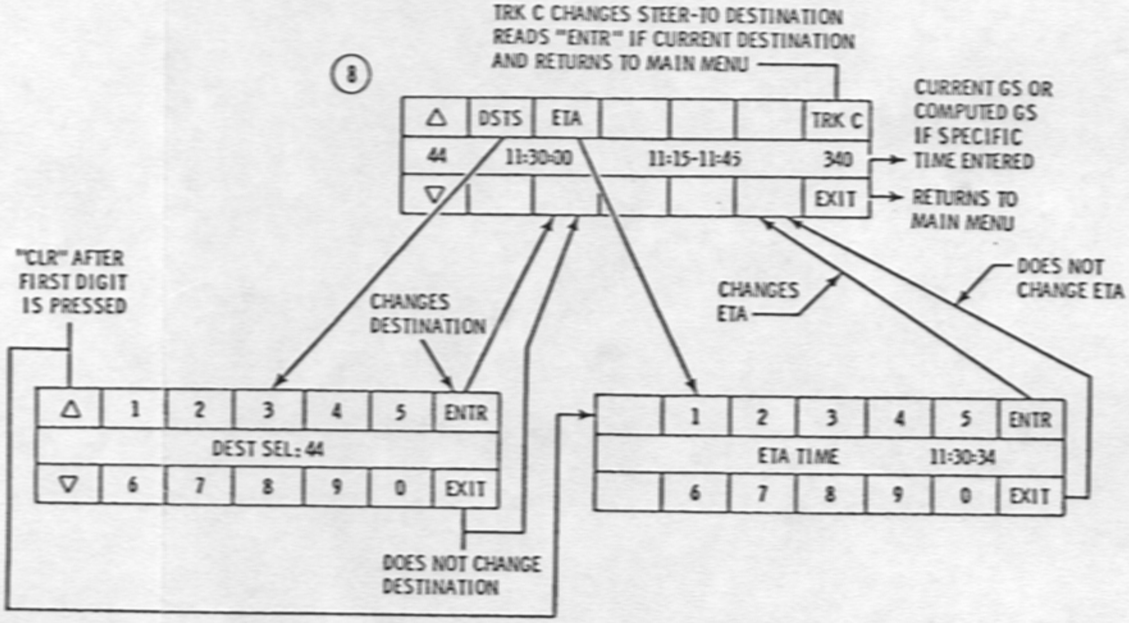
IATION
TURNS

DATA ENTR


⑦
INITIALLY OFF IF ALTITUDE IS ON
BLANK IF A/P IS NOT ENGAGED
1
2
3
4
5
ENTR
ALTITUDE: 12000
HOLD
6
7
8
9
0
EXIT
ENGAGES NEW VALUE AND RETURNS TO MAIN MENU
STORES NEW VALUE AND RETURNS TO MAIN MENU
ALTITUDE KEYPAD

NOTE

⚠1 When "OFF" is pressed, altitude mode is disengaged and returns to main menu.

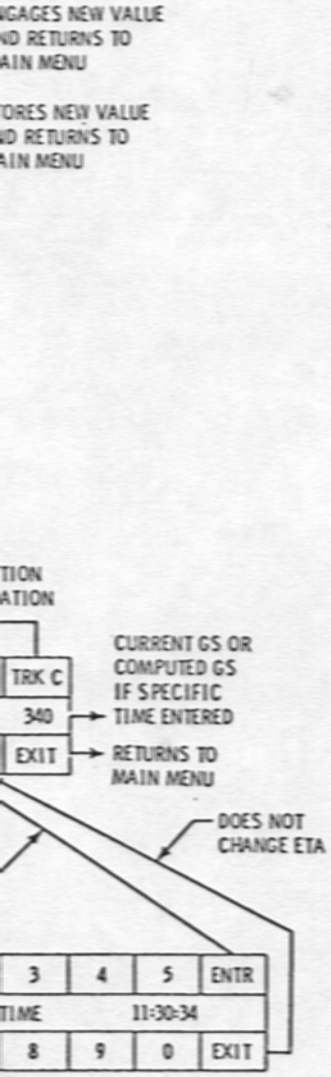

⑧
TRK C CHANGES STEER-TO DESTINATION READS "ENTR" IF CURRENT DESTINATION AND RETURNS TO MAIN MENU
△
DSTS
ETA
TRK C
44
11:30:00
11:15-11:45
340
▽
EXIT
CURRENT GS OR COMPUTED GS IF SPECIFIC TIME ENTERED
RETURNS TO MAIN MENU
"CLR" AFTER FIRST DIGIT IS PRESSED
CHANGES DESTINATION
CHANGES ETA
DOES NOT CHANGE ETA
△
1
2
3
4
5
ENTR
DEST SEL: 44
▽
6
7
8
9
0
EXIT
1
2
3
4
5
ENTR
ETA TIME 11:30:34
6
7
8
9
0
EXIT
DOES NOT CHANGE DESTINATION

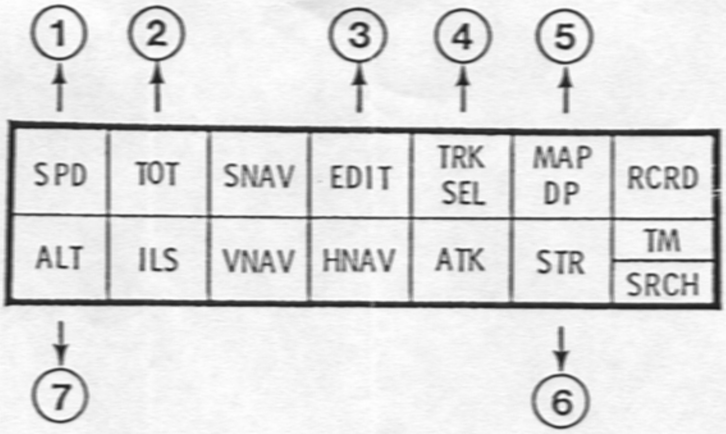
NOTE

SNAV, VNAV, HNAV, RCRD a
do not change *MAIN MENU*.
and SNAV, activate the *MDPS*
Navigation Modes. RCRD sele
source and will change to STE
the recorder is threading the
toggles sensor display betwee
monitor and search modes.

FIGURE F

DATA ENTRY PANEL DISPLAYS





DEP MAIN MENU

NOTE

SNAV, VNAV, HNAV, RCRD and TM SRCH do not change MAIN MENU. VNAV, HNAV and SNAV, activate the MDPS Preplanned Navigation Modes. RCRD selects the recording source and will change to STBY (backlit) while the recorder is threading the tape. TM SRCH toggles sensor display between terrain monitor and search modes.

PARAMETER	LIMIT	
	LOW	HIGH
TRK CHG	1	99
DEST STR	1	94
CAS	140 KTS	525 KTS
MACH	0.20	0.90
AOA	7.0	9.5
MAN HDG	0	360
ILS	0	360
TCN	0	360
CRS SEL	0	360
ELEV	-2000 FT	99,000 FT
OA1 ELEV	-2000 FT	99,900 FT
OA2 ELEV	-2000 FT	99,900 FT
MEA	1000 FT	99,900 FT
ALT	1000 FT	99,900 FT
VRT VEL (FT/MIN)	-99,900 FT	99,900 FT
TOT	00:00:00	23:59.59
WIND DIR	0	360
WIND VEL	0 KTS	999 KTS
FUEL	0 LBS	99,900 LBS

KEYPAD ENTRY LIMITS

F213-OCIP-FO-3(1)id

SHEET 1 OF 2

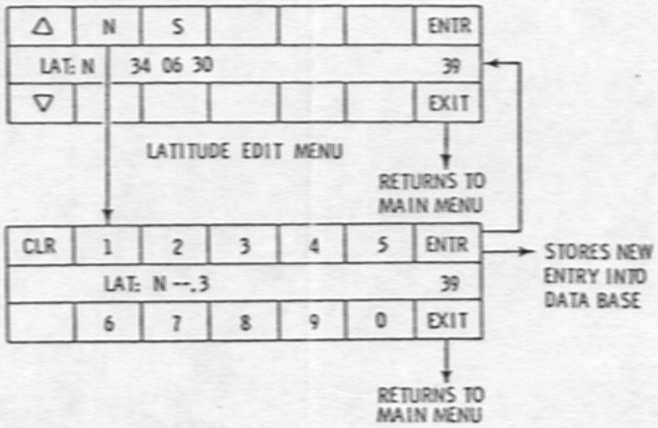
FIGURE FO-3 (Sheet 1 of 2)

③

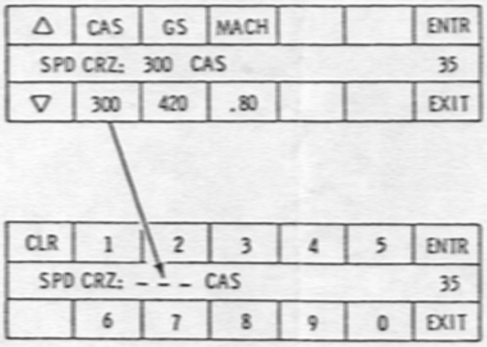
NOTE

The parameter indicated by the edit cursor on the edit CMDI display is also shown on the status line of the DEP and will be the edited variable. The MAP DP button is used to select the destination point for editing and will call up the keypad menu.

A

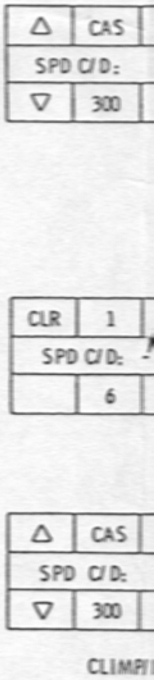


B



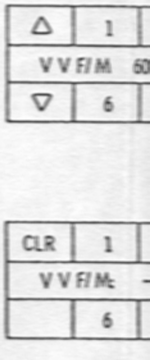
SPEED CRUISE EDIT KEYPAD

C



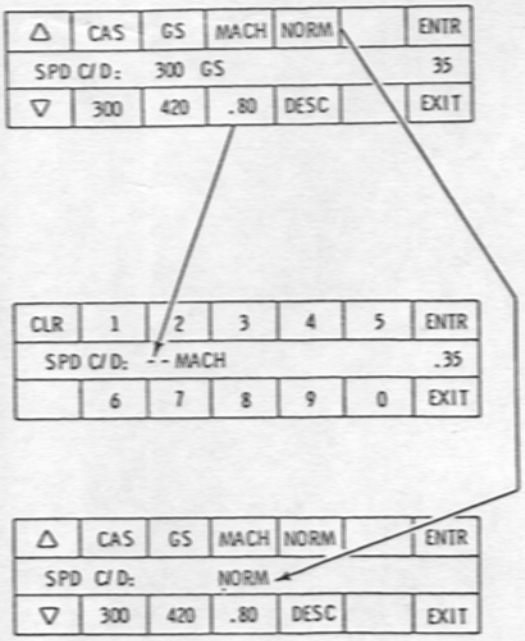
CLIMB/

D



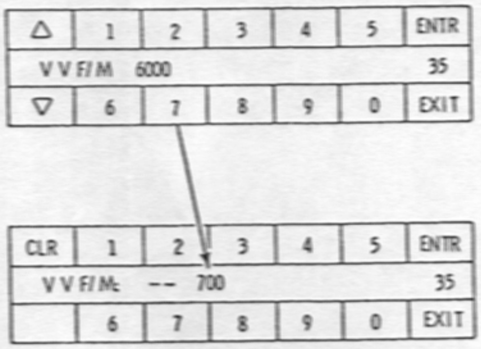
RATE OF C

C



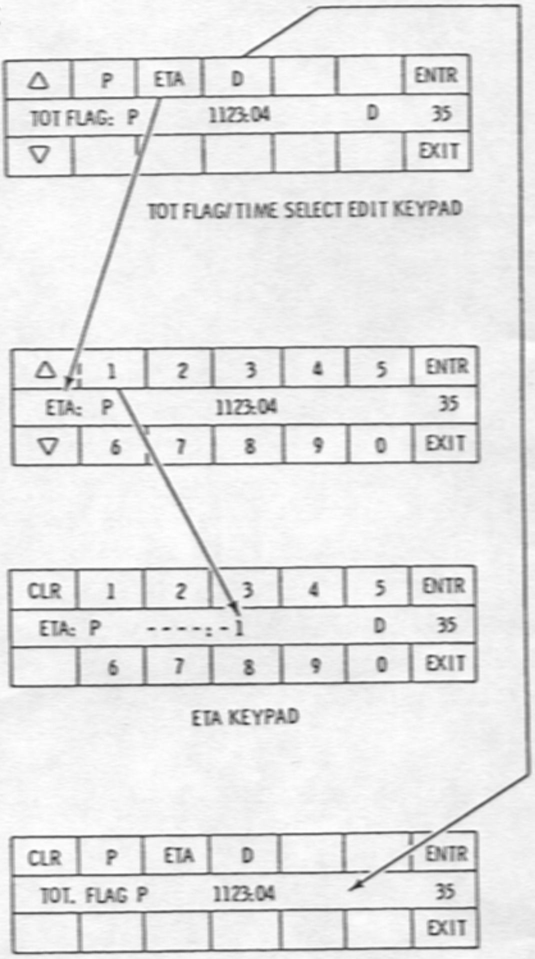
CLIMB/DESCENT SPEED EDIT KEYPAD

D



RATE OF CLIMB/DESCENT EDIT KEYPAD

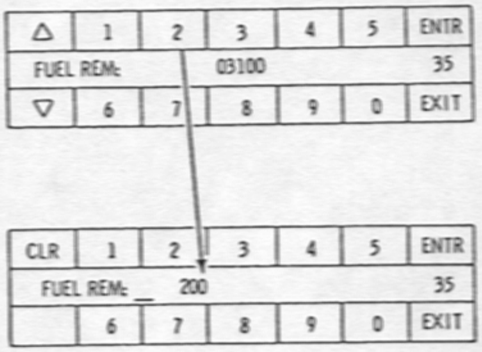
E



TOT FLAG/TIME SELECT EDIT KEYPAD

ETA KEYPAD

F

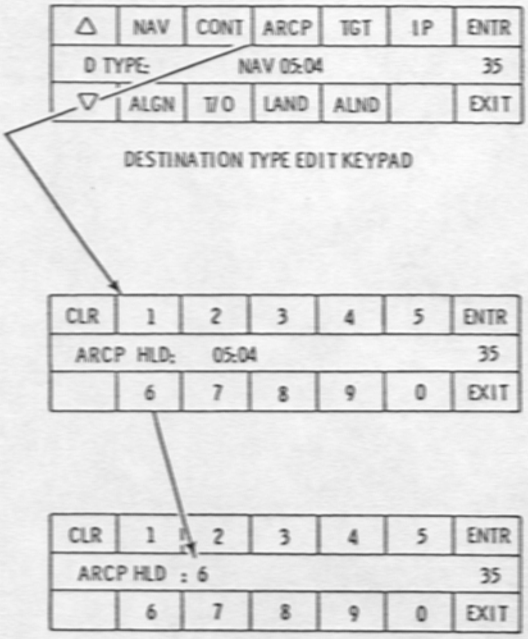


FUEL REMAINING EDIT KEYPAD

G

H

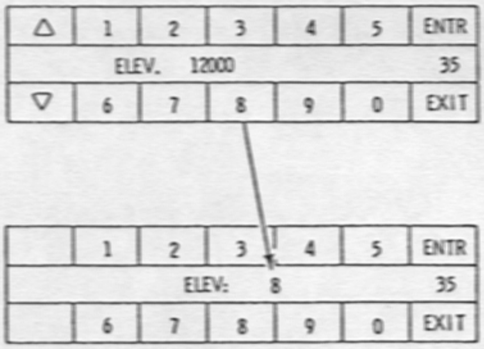
G



DESTINATION TYPE EDIT KEYPAD

HOLDING TIME EDIT KEYPAD

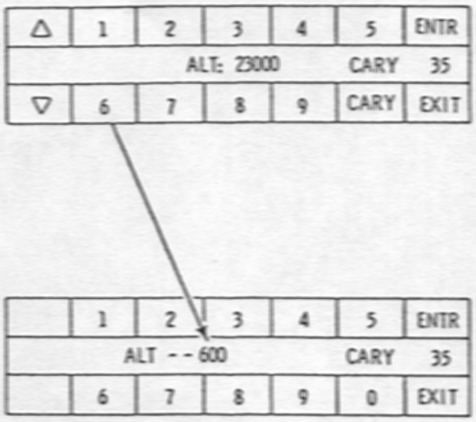
H



THE "+/-" OPTION
IS AVAILABLE ONLY
AS "1st PUSH" AND
TOGGLES SIGN BETWEEN
PLUS AND MINUS.

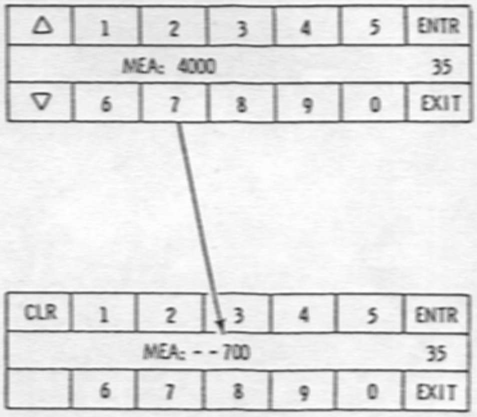
ELEVATION EDIT KEYPAD

I



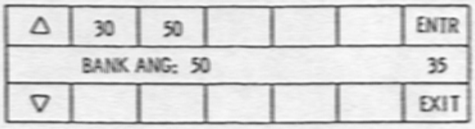
ALTITUDE EDIT KEYPAD

J



MEA EDIT KEYPAD

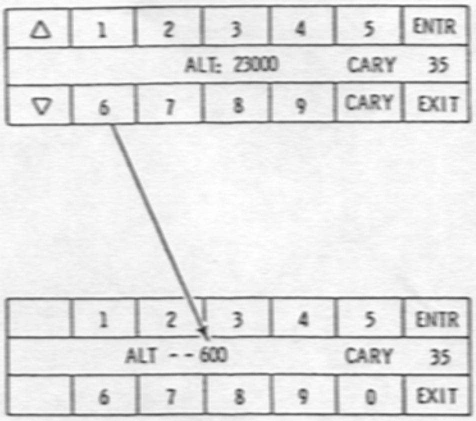
K



BANK ANGLE KEYPAD

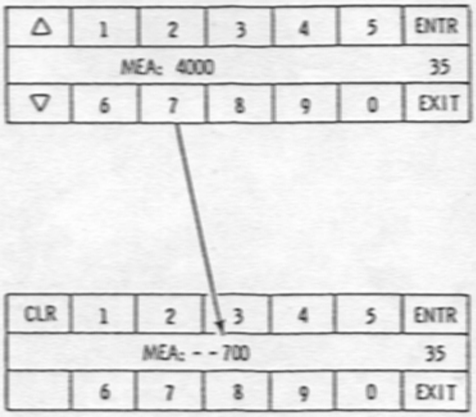
DATA ENTRY PANEL DISPLAYS

I



ALTITUDE EDIT KEYPAD

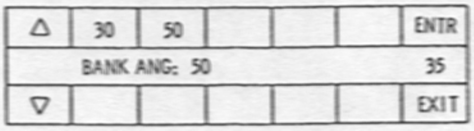
J



MEA EDIT KEYPAD

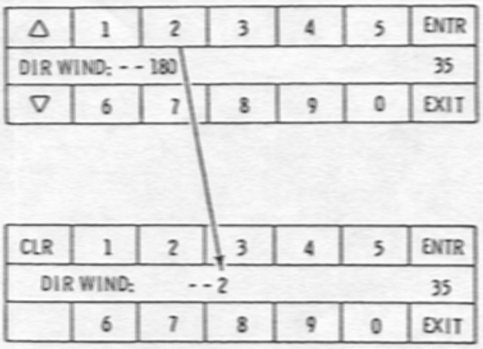
N
NLY
AND
ETWEEN
S.

K



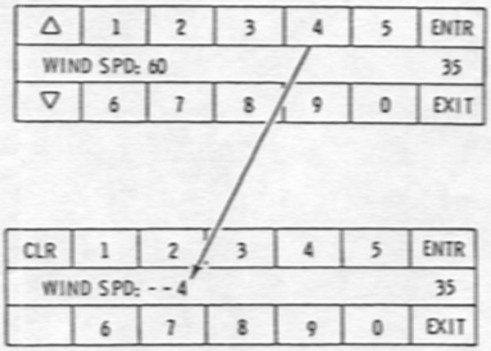
BANK ANGLE KEYPAD

L



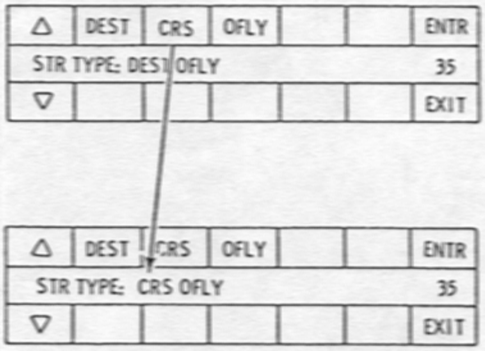
WIND DIRECTION EDIT KEYPAD

M



WIND SPEED EDIT KEYPAD

N



STEER MODE EDIT KEYPAD

F213-OCIP-FO 3(2)(a)
SHEET 2 OF 2

FIGURE FO-3 (Sheet 2 of 2)